From the lakes...

... to the trees

An environmental handbook for camp leaders

Ontario

Ministry of the Environment

Hon. Harry C. Parrott, D.D.S., Minister

Graham W. S. Scott, Deputy Minister

1979 International Year of the Child

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FROM THE LAKES ... TO THE TREES

An Environmental Handbook

for

Camp Leaders

1979

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Ministry of the Environment (1977)

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Ministry of the Environment (1978)

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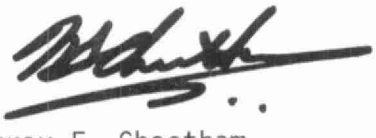
For the past three summers, Ministry of the Environment staff have been visiting children's camps across the Province to demonstrate a wide variety of environmental sampling techniques. Their objective was to increase the environmental awareness and appreciation of the youngsters of Ontario and to assist camp directors in the establishment of an environmental studies program.

Often, The Ministry was asked for detailed outlines of the activities carried out in the camp setting so that the studies might be continued by the camp counsellors.

This handbook has been prepared to meet those requests. It consists of a variety of field studies, tips on nature identification, games, songs, poetry, and a list of additional readings. In 1979 the handbook was edited, revised, new lessons added and other expansions made to the overall content to further assist in the enhancement of an environmental studies program.



Murray F. Cheetham
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Leading Campers on a Field Trip

I Before the trip

Prepare yourself --

- know the territory
- start with a specific objective
- know the subject or activity you plan to use
- choose identification books to take along

Prepare camp

- notify supervisor of your activity and proposed route
- make arrangements for meals, if necessary
- discuss opportunity for follow-up activities with other leaders, i.e. arts and crafts instructor

Prepare campers

- create an objective (what, were, why, how long?)
- build anticipation
- familiarize them with any required skills

II On the trip

- walk in front of campers when travelling to site
- use silent hand signals for control (raised hand means quiet)
- establish base of operations
- be sure campers understand what they are to do
- divide in smaller groups, if appropriate
- use all senses
- encourage discovery
- be spontaneous, enthusiastic
- set reasonable time limit
- take advantage of unexpected opportunities
- be flexible

NOTE: Six to eight campers is an ideal number for a field trip conducted by one leader.

Field studies

LESSON PLAN FOR STUDYING SOIL

Introduction

The following soil study has been designed for boys and girls 9 - 14 years of age, to make them aware of the various properties of soils and to provide them with a greater understanding of the importance of soil as a life supporting system. The activity, while allowing the campers to gain more knowledge about the soil, at the same time, forces them to make use of their senses and increase their appreciation of their surroundings.

This study can be adapted to other age levels. For example, a more advanced soil study could involve determining the soil type of an unknown sample. Further testing of soil porosity, water holding capability, acidity, etc., will enable young people to understand the different physical and chemical characteristics of each type.

The activity should be conducted in an outdoor setting with no more than 15 campers working under one leader. It should take approximately one hour.

Equipment

newspaper, spoon, hand lens, soil samples from different areas, watch to time percolation rates, soil comparison chart.

Procedure

1. Begin by handing each camper a sheet of newspaper and a spoon. Instruct the children to choose an area either in a field, forest, or near a body of water; explain that it is necessary to obtain samples of soil from different areas to see if any differences may exist. The campers should dig down several inches and gather three or four large handfuls of soil. Collect the dead surface vegetation in the sample.

2. Upon returning with their samples, allow the campers to examine the soil samples for at least fifteen minutes. A discussion can follow based on questions put forth by the leader. The type of questions asked should require the campers to observe the various properties of the soil. Ask campers to draw and, if possible, write down the different things which they find in the soil. the soil chart should be used during the examination and discussion.

   ### Sample Questions

   A. What is the soil made of? Did you see anything that makes you think that the soil is made of these materials? (If children do not suggest that rock crumbles into soil, ask questions such as: What happens when you rub two stones together?) What causes the rock to break down into soil? Can you find any rocks that show signs of weathering? Are there any particles present? What are they? Were these particles always this size or have they changed? If you think they have changed, how did this change occur? What else, other than rock is needed for soil?

   (Answer: decaying leaves, wood, dead organisms are also needed.)

B. Ask the campers to describe what their soil looks like? How does it feel? Squeeze a handful of soil: compare the texture, the way the soil holds together. When you press a large piece of soil in your hand does it squash, or does it break up easily, or does it require more pressure? Why? What differences can you see between the different samples of soils? (Color, texture.) What do you think causes these differences?

C. Smell the soil: Does it have a smell? What does it smell like? What do you think causes the soil to smell? Take a handful of soil from near the surface. Squeeze it, holding your hand near your ear as you do so. Do you hear anything? Describe what you hear.

D. If you were going to make the very best possible soil for growing plants and trees, what would you put in it? Why? Are rock particles of any value to the soil? Why? Are animal particles of any value to the soil? Why? Are plant particles of any value to the soil? Why?

3. Further observations may be made by pouring water on soil and observing what happens. Was the water absorbed? How quickly? Why does water soak into some soils faster than others? If the water was not absorbed into the soil, where did it go? Did anything sink into the soil with the water?

4. To test the water percolation rate of a soil sample, a volume of soil is placed into a can which has holes punched in the bottom. Another flask, containing a known volume of water is poured over the soil sample. Clock the time it takes from when the water is first added to when the first droplets pass through the holes in the bottom of the can. A comparison of the times required for drainage among the soil samples would provide information on which soil types hold moisture longer than others.

   By glancing at the completed soil chart, it should be apparent that the soil samples differ in their characteristics. This indicates the samples are different soil types (i.e.: clay, loam, sand).

   What makes different soil types? Soil is composed of 2 components: Rock and humus. Therefore, different soil types are a result of different types of rock (e.g. sandstone, granite) and humus (e.g. deciduous or coniferous leaves).

   Color, grain size, texture and rate of water percolation are the characteristics determined by different rocks.

   The smell, color and rate of water percolation are characteristics determined by the source of humus.

   Why is soil important? Soil is biologica-ly important as it provides food and homes for plants and animals. The animals and plants present at any site will be determined by the soil type.

FOLLOW-UP ACTIVITIES

The Soil Game

Separate the group into two (five to eight campers in one group, the reamining campers in the second group). Assign the title "clay particle" to about one-third of the individuals of the larger group. Assign the title "silt particle" to some individuals and "sand particle" to those remaining. The second group will become a "plant part", except for one or two children who will be the animals who live in the soil.

Place the "sand, silt and clay particles" in a disorganized clump -- individuals stand at arm's length. Explain that the soil is mixed in this way: that space between the particles is filled with air, water, plant roots, organic material (decomposing), and animals. Will the soil be different if most of the particles are clay? Or sand? Or silt? A soil that contains about equal parts of each is called a "loam" soil; one containing mostly clay is termed a fine-textured or clay soil, etc. All campers hold their positions.

After this is understood, create a plant root by arranging the individuals of the small group (five or six) in a straight line, have them hold hands, and move apart until their arms are extended. The leader of this line represents the "growing point" of a plant root and he weaves his way through the spaces in the soil clump until he reaches the other side of the group. Stop and hold this position.

In order for the campers to understand that the plant root takes minerals and plant food from the soil particles, water and air from the open space, and anchors the plant growing above, ask questions such as: What does the plant need to grow? Where does it get it from? How else is the soil important to the plant? The individual animals now move about through the open spaces finding food, shelter and water. (Bacteria, molds, and other small creatures are included in the term "animals".) Following further discussion whereby campers express their experience by talking, ask them to demonstrate how the plant root and animals would move through soil which is entirely sand and soil which is entirely clay. Possible questions which could be asked include: What differences do you notice between sand and clay? Do you think plants and animals could survive very easily in soil which is entirely sand or entirely clay? Why or why not?

Repeat the above activity and ask, "What happens when rain falls on the soil?" Some runs off the soil surface, some evaporates back into the air, and the remainder passes through or is held in the soil pore spaces between the soil particles. Explain that when water runs off, it may carry soil particles away (erosion).

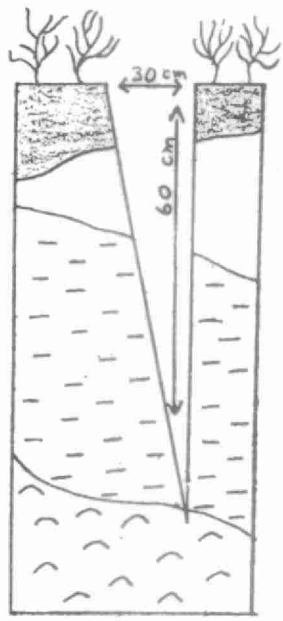
Repeat the game above and emphasize what happens if a building, highway, or other solid covering is placed on this soil. What may happen to the pore space? (Move closer together.) What happens to water and air? (It decreases.) What happens to the plant roots and animals living in the soil? (They may disappear.)

Repeat the soil game and emphasize what happens if grass or other vegetation is planted on bare soil. (Soil pore spaces become larger, more roots grow, and the soil will hold more water and air.)

CONSTRUCTING A SOIL PROFILE

The study of a soil profile can also be undertaken by children at the primary/intermediate level.

Procedure: Use a spade to dig a hole 30 to 60 cm deep, depending on the thickness of the upper layers. Try to make one side of the hole as straight as possible.



A Typical Soil Profile

A Top soil layer, dark brown in color (several centimeters)

A2 Zone of leaching, light brown in color

B Zone of accumulation, reddish-brown in color (several centimeters - several meters)

C Parent material, grey brown in color

Allow campers to look at the hole you have made and ask questions such as: Does the color of the soil change the deeper you dig? Does it feel the same as you dig deeper? Does it look the same as you dig deeper? How far down do the roots grow? Do you think that all soil profiles look the same? Why?

The formation of soil horizons is caused by the action of plants and animals in the rock particles. They add humus to the soil. Water, percolating down, carries the fine particles of the soil to lower levels. Since organisms and climate vary from place to place, the composition and depth of the soil horizons at different places will vary. Older children may wish to do a soil profile in an old field or a deciduous and a coniferous forest.

Following a discussion of a soil profile, ask campers to construct one of their own. This can be done by using cardboard, glue, various kinds of soil, twigs, leaves, etc.

The "Soil Game" was originally prepared by the Arizona Department of Education, and appeared in the publication "Elementary Teachers Resource Guide for Environmental Education". Additional soil profile projects may be duplicated from Soil Ecology, by W. A. Andrews, Prentice-Hall Publishers, 1972.

The following chart may assist children at the primary/intermediate level to determine soil types.

CHARACTERISTIC	SAND	CLAY	LOAM
Color	light _____	medium _____	dark _____
Grain Size	large _____	tiny _____	medium _____
Humus* Content	slight (if any) _____	moderate _____	rich _____
When rolled through your fingers, it feels	rocky _____	dry: hard & plastic _____ wet: stiff & sticky _____	gritty _____
Speed of water flow allowed by the sample	straight through _____	allows very little, if any _____	moderate to slow _____

* Humus is the black or dark substance in soils formed by the decay of vegetable or animal matter. It provides food for plant life.

WOODLAND ACTIVITY

A walk in the woods can be an exciting adventure or one of the dullest of camp activities.

The following guide was prepared to give leaders suggestions on how to introduce the "wonders of the woods" to their campers.

The basic goal is to encourage youngsters to greater observations and insights. One of the concepts stressed is that there is nothing in this world that doesn't change.

Have each of your campers make a special notebook to record their observations.

This can be a very simple notebook consisting of pages stapled together or a more elaborate booklet with a fancy cover. Consult with your arts and crafts leader.

Now go for your walk.

I For the youngest campers

The Indians and colonists used the natural materials in the woods to get their colors for dyes. Find as many things in the woods that you think might give a color and try them on pieces of paper. Later paste them in the Activity Book.

The edge of the woods is filled with many wild plants. After a brief demonstration of colors that these plants produce, the children go off to find as many different colors as they can. Bark sometimes gives a rich brown; some berries are orange, blue, or red. Some flowers give interesting results, and there are the surprises when a blueberry gives a green color.

Make a rubbing of the largest leaf you can find. For instructions on how to make rubbings -- see Arts and Crafts Section.

Rubbings are a very good way to record in the woods. This activity gives experience in the concepts of size -- largest, smallest, etc. The directions could call for three leaves ranked on the page according to size. An exercise in ordering.

Make a rubbing of as many different shaped leaves as you can find.

If this is too complicated, the children might make rubbings of three different shaped leaves. This activity helps the child to decide what "different shape" means. A big maple leaf and a small maple leaf may be different in size, but they are not different in shape.

There are many little animals in the woods. Most are hiding. Some come out to hunt at night. Some live under rocks or in dead logs. See if you can find one and draw a picture of it.

Almost every child that has ventured into the woods is fascinated by small creatures. The children undoubtedly discover these animals anyway, but the additional request that they draw what they see requires them to observe more closely the animals' physical characteristics and movements. The millipede is curled up, but unfolds and meanders away when held for its "portrait". The pill bug also curls up, but it moves differently and has a hard shell.

Things in the woods feel different. Some feel smooth and some feel rough. Find something that is smooth and something that is rough and make rubbings of them.

This could be altered -- for example, it could be a page that requests opposites. Something soft and something_____(dry, hard, rough). These objects could also be pasted on the paper, not rubbed.

Find something that changes and later paste it in your notebook. Can you find something that never changes?

This question appears easy. The children are generally puzzled until the idea dawns that there is nothing in this universe that doesn't change. A very valuable learning experience.

II For the intermediate camper

All living things in this world depend on other things in order to live. Make a rubbing of a big leaf. This leaf needs_____in order to grow. What living things need this leaf in order to grow?

This question requires some writing and is a departure from the more direct activity-oriented pages.

There are many animals in these woods. Most are hiding. Some come out to hunt at night. Some live under rocks or in dead logs. See if you can find one and draw a picture of it from below. Show how it looks from the top and from the sides. See if you can find the name of the animal in a book and write its name under your drawing.

The beginning of this question is the same as for the elementary level, but the latter part extends the work to higher age levels.

The woods sometimes seem all green, but there are many other colors you can find. Collect a number of colorful things and paste them in your notebook. What color did you find the most? Was there a color that you didn't find at all?

This activity is especially interesting in the late summer with the many bright leaves or in early spring with the multitude of wild flowers.

III For the seniors

When the dinosaurs lived here this land was different. It was much warmer and most of the present area was covered by swamps. Some of the same kinds of plants that we have now grew here at that time. Find a plant variety that you think grew long ago and make a rubbing of it. Or find a plant type that wasn't around when the dinosaurs were here.

The question here is more involved and attempts to utilize the knowledge and experience that it is assumed the camper has acquired by this stage.

Note to the Leaders:

Always carry a bag equipped with crayons, paste, magnifiers, thermometers, reference books, rubbing paper, string, tape measures, etc.

In attempting to evaluate this approach to woodland guided walks, one of the primary achievements is that of total involvement. Although different campers vary quite naturally in their degrees of success, they all must pick up a leaf, or find an animal. They must touch, smell, and look. They must also think of what might be the proper response to a question, and generally, there is more than one answer. The leader becomes the person to help and encourage. It is not the leader's role to be always "finding" discoveries. This encourages children to depart from the narrow trail following on the heels of the child in front of him.

Woodland activities are not designed to replace the continuous return to a spot with all the scientific materials for detailed study. The objective is primarily to have an introduction, a vehicle to open the senses of the campers and gain their participation in an active exploration of the woods.

Adapted from an article by Alice Ballin, New Canaan Country School, Connecticut as published in the book "Environmental Education in the Elementary School...A Selection of Articles Reprinted from Science and Children". This book is available from the National Science Teachers Association, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009. Price $4.75.

SIMPLE COMPOSTING OF DOMESTIC WASTE PRODUCTS

Composting is one means by which we can recover tangible benefit from our garbage and in so doing, reduce the volume of solid waste requiring disposal. It can become not only a hobby, but a beneficial and economical advantage to the home gardener or camp director.

The humus material from a compost heap has long been accepted as a soil additive and mulching agent which can be produced inexpensively in one's backyard. When added to the top soil, it improves texture, porosity, and water holding capacity and increases the organic content of the soil.

HOW TO COMPOST

Generally speaking, composting involves taking organic waste material and placing it in a soil culture rich in natural organisms. The extent to which one gets involved in composting depends entirely upon the individual and the availability of the materials needed. However, this is a simple, inexpensive approach to constructing a compost heap:

LOCATION:

You can locate your compost heap in an inconspicuous corner of your yard or you can choose a central site and decorate it to suit your landscape. However, be sure that the spot is airy and sunny. If you are thinking about building a composting heap at your cottage or camp, be sure that it is away from waterways and wells and at least one foot above the water table.

CONSTRUCTION:

Home composting is best done in some form of enclosure. Choose a size convenient to your needs, whether it's a 90 cm square box or an enclosure 300 cm on a side. The pile can be as shallow as 30 cm or as deep as 150 cm.

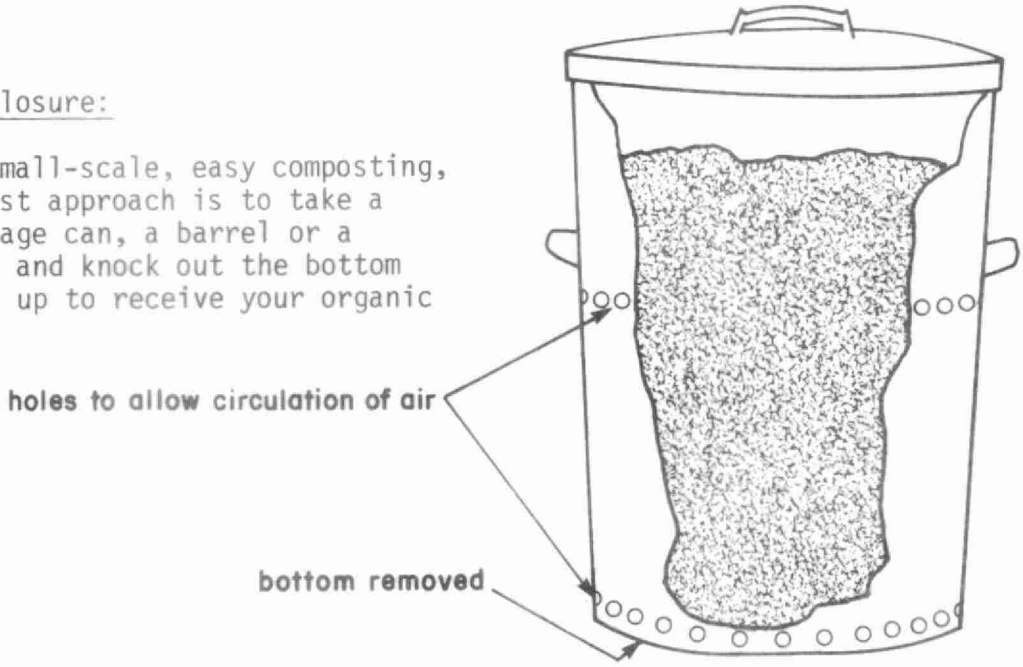
- Mark off a 120 cm square on the ground and dig a pit between 30 cm and 45 cm deep. The pit provides some warmth in winter months and keeps the compost damp in summer.

- Drive four stakes approximately 5 cm square by 60 cm long into the ground at the corners, leaving 30 cm of the stake above ground.

- From a sheet (240 cm x 120 cm) of .6 cm aspenite plywood, cut four 30 cm x 120 cm rectangles and nail them to the stakes forming a 120 x 120 x 30 cm enclosure. Leave a small space, about 2.5 cm, around the bottom so that air can circulate up through the heap. The remaining half of the sheet will be used as a cover for your heap during winter. In summer, a sheet of heavy gauge plastic placed on a 120 cm x 120 cm frame of 5 cm stock will be used as a cover. This will keep your compost heap from being a breeding ground for insects and will also help retain moisture.

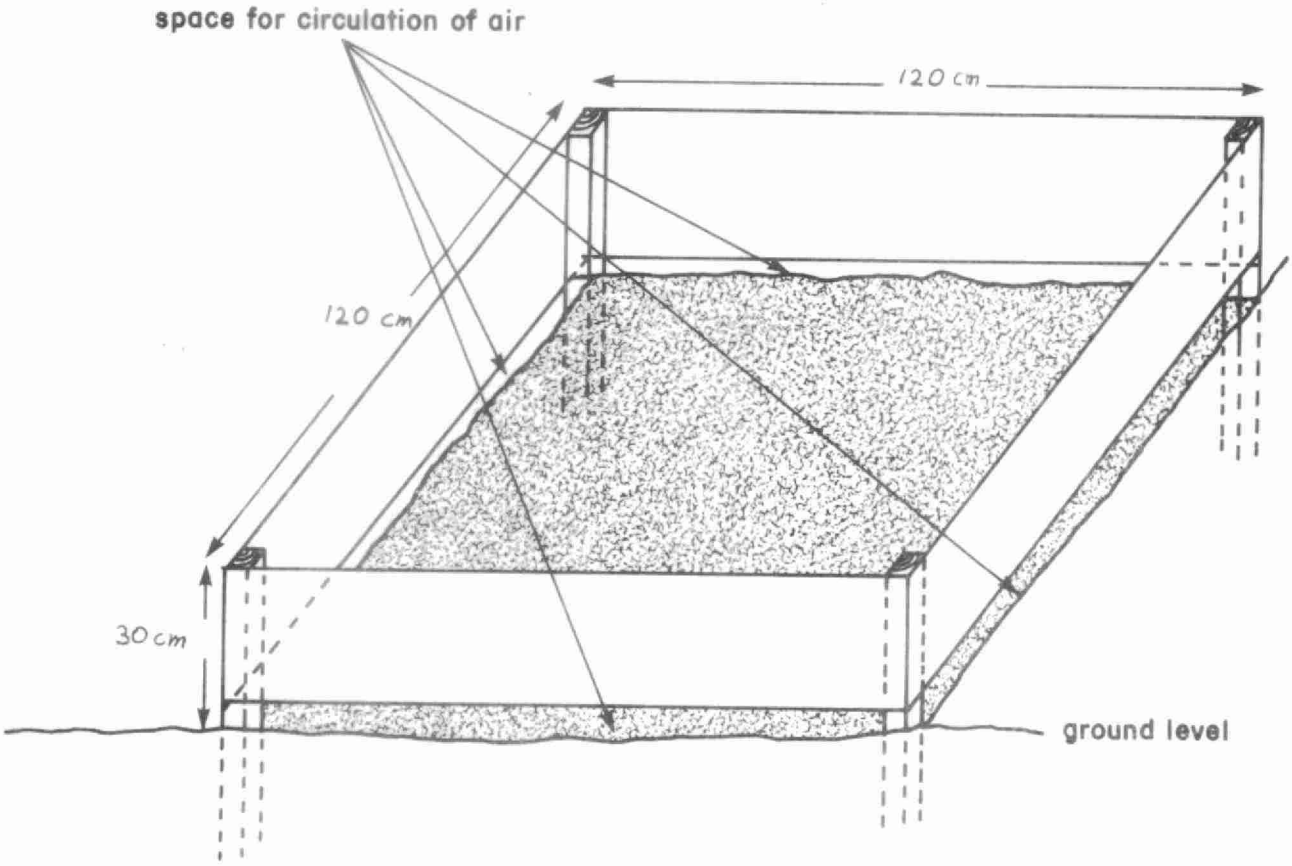
Simple enclosure:

For small-scale, easy composting, the simplest approach is to take a large garbage can, a barrel or a wooden box and knock out the bottom and set it up to receive your organic wastes.



Custom enclosure:

A composting enclosure can also be tailor-made in any size. These directions show how to build an enclosure 120 c.m. square rising 30 c.m. above ground level.



Your composting bin is now ready to receive your organic·wastes.

COMPOSTING:

Many methods for adding waste material to compost heaps are used. The simplest is to add material as it becomes available. Be sure not to add thick layers of finely ground material such as sawdust. These materials will pack tight and prevent adequate circulation of air.

Another method is to arrange your compost heap into layers by placing a thin layer of a commercial starter (or fertilizer) between each 6" to 8" of garbage. The starter is used to increase the bacteria count and the fertilizer will increase the nutrient content of your pile.

Whichever method you choose, remember that for your compost heap to function adequately, it must be kept moist but not soggy. Every two or three weeks the pile should be turned. This mixes and aerates the raw compost.

While the garbage is decomposing, heat is produced. This heat should be contained by covering the pile. Heat keeps the natural organisms functioning effectively to decompose the waste.

After every turning of the heap, heat again builds up. When the heat production stops, your compost is ready to be used as low grade fertilizer and soil conditioner.

WHAT TO COMPOST:

Organic wastes are the main source of material for a composting heap. These are everyday household ingredients which can be added to a compost heap:

kitchen garbage

vegetable and fruit peelings

coffee grounds

*egg shells

*clam and oyster shells

peanut and nut shells

leaves

*sawdust

pet waste

*newspaper

barbecue grill residues

straw and hay

garden residues

grass clippings

*acceptable in small quantities.

With a little time and effort, and a minimum of expense, you can successfully reclaim some of your kitchen wastes in compost and reduce, at least in part, some of your camp's garbage problems.

LAWN STUDY: AN EDUCATIONAL FACT SHEET

Introduction

In this activity campers are put in contact with a community of life as illustrated in the field. By exploring an area of a field for plant and animal life and by looking at the physical environment, children are made aware of the interactions between these components. A follow-up could extend into the areas of climatology, soil studies, botany, zoology, arts and crafts, and creative English.

The field work is most suitable for two children working in one quadrant with a maximum of fifteen students working under one instructor. This study takes approximately one hour.

The questions listed in the procedures section are merely suggestions and should be adapted to the age level of the children.

Equipment

1. tent pegs, wooden stakes, or popsicle sticks (four for each group)
2. string
3. thermometers
4. magnifying lenses (optional)
5. measuring tapes or rulers
6. paper and pencils

Procedure

Before entering the field, the instructor should take time to explain the following:

A. how to set up a quadrant (instructions are given at the end of the fact sheet)
B. what to look for
C. what to record
D. what characteristics to measure

Ideally the study should be initiated in an area where a blackboard or a flip chart is available for the instructor's use.

1. To lead into the activity ask:

   (a) What kinds of things will we find in the quadrant?
   (b) What kinds of animals will we find on the ground, in the ground, or flying over the ground?

   List the campers' responses on the board for later referral and comparison. In this way a discussion can be centered on why all things may not be able to exist in the area.

2. The campers should then be divided into groups of two or three and the equipment distributed. Either allow the boys and girls to pick their own study area or assign them to a specific location.

   It will be more beneficial to the campers if the quadrants under study differ in some way. Quadrants set up under trees will reveal a different community than ones set up on a hill or in an open field.

   After the campers have set up their quadrant, the instructor should visit each one.

3. The campers should make general observations about the area in their notebooks.

   (a) What type of terrain is the quadrant in? Is it open and flat or is it steep and rolling?
   (b) Is it sunny and hot or shady and cool?
   (c) Is it windy or is it calm? What direction is the wind blowing?

4. Specific characteristics of the vegetation and animal life found in the quadrant should be recorded.

   Vegetation

   (a) Is the width of all grass blades and their heights the same throughout the plot? Is there more than one species of grass?
   (b) Can you find different colors of vegetation?
   (c) If seeds are present, how did they get there and where did they come from?
   (d) Are the plants in the quadrant low growing or creeping, or are they bushy and tall?
   (e) Can you find any dead or decaying vegetation? Why is it important?
   (f) If dandelions are present, are they in flower or have they all gone to seed?
   (g) Can you find any clover with more than three leaflets?
   (h) Is moss found in dry or moist places? What does it feel like?
   (i) Are there any wildflowers in your quadrant? Do they have a strong or a weak scent? Why is this important?
   (j) By looking at the down in the flower heads of thistles and the spines on the leaves, how do these features adapt it for survival?

   Animal Life

   (a) Do you see any insects such as bees, wasps, flies hovering over a particular type of vegetation?
   (b) What kinds of sounds can you hear?
   (c) Are there any insects such as aphids, grasshoppers, or leafhoppers on the plants?
   (d) Are they moving? How fast do they creep?
   (e) Can you find the same insects in both short grass and in long grass?
   (f) Have the pupils get down on their hands and knees and carefully part plants so that they can see the ground surface. Spiders, beetles, land snails, slugs, larvae, mites may be found. How are these animals suited to their environment?
   (f) Can you find any evidence of animal life such as worm castings, worm holes, ant hills, or spider webs?

5. Physical characteristics of the quadrant should also be examined.

   (a) Is the soil wet, moist, or dry? What color is the soil? Looking at the particle size, texture, and porosity of the soil, how might these features affect the animal life?
   (b) Have the campers record the temperature on the ground and about four feet above the ground. Does the temperature difference play a role in the survival of life in the quadrant? Compare temperatures taken with children.

Records

Campers should record what they have found, heights of vegetation, temperatures, and a description of the geographical setting. A study sheet with these headings printed out may be distributed to each youngster, if desired. Drawings may be made of the quadrant and of vegetation or animal life that was found.

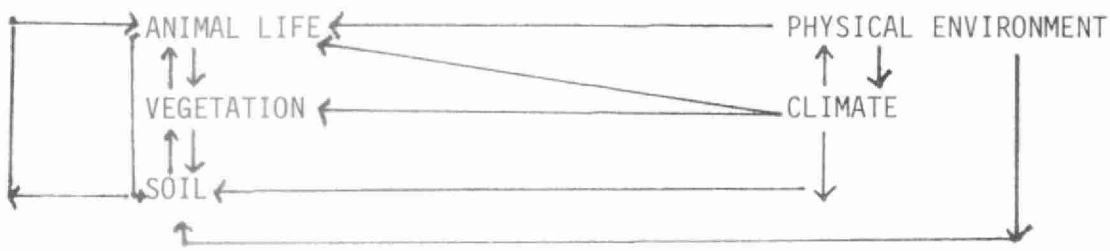
By counting the number of different species in the quadrant, campers can contrast their population densities with others and discuss reasons why these differences occurred. It is not essential that every blade of grass be counted but by a general survey it could be determined for example that the quadrant consisted mostly of clover.

Follow Up

After the field work has been completed, results can be compared and discussed with the entire group.

Summary

This model illustrates how the different characteristics studied in the quadrant can affect each other.



NOTE: It is wise to have identification guides for flowers, insects, and weeds on hand.

Setting Up A Quadrant

1. Using a tape or ruler measure out one metre on the ground.
2. Push a tent peg into the ground at either end of the tape.
3. Pick up the tape and lay it down at a 90 degree angle from the previous peg.
4. Repeat previous steps until all four pegs are positioned.
5. String can be tied between all the pegs to complete the quadrant.

AQUATIC HABITAT STUDY

INTRODUCTION

In this activity campers are put in contact with a community of life as illustrated by an aquatic environment. By exploring an area of a pond or stream for plant and animal life, and by looking at the physical setting, campers are made aware of the interrelationships that exist among these components.

Aquatic communities can be found in two areas: (1) in standing water such as ponds, lakes, and swamps, and (2) in running water such as rivers, creeks, and streams. The degree of water movement has much to do with the kinds of organisms existing in these communities.

To carry out the following activities, the campers should work in teams of two or three. Each group will study a 15-foot section of the stream by: (1) observing the physical surrounding, and by (2) sampling organisms found on the surface, directly in the water, on or in the bottom sediment, and along the shore. The data derived from these activities will provide information for discussion and for further investigation, if desired.

OBJECTIVES

The general theme of this learning experience is that fresh water habitats are natural environments in which communities of both plants and animals live. This theme is based on the following concepts:

1. Animals and plants can be found in almost any body of fresh water, whether it is temporary or permanent, large or small.

2. Some animals and plants are so tiny that we must use magnifying instruments to see them.

3. Aquatic habitats provide the plants and animals that live in them with all of their basic life needs.

4. The community that we live in has many different people -- doctors, teachers, street cleaners, and truck drivers. It also has many different types of buildings -- schools, stores, hospitals, and our homes. We need food, shelter, and sometimes medicine in order to survive. There are many different kinds of communities in the world. The one we are going to study is found in a stream or lake.

PRE-FIELD TRIP PREPARATIONS

Choosing a Field Site

Prior to beginning the field activities, the instructor should decide on the stream site where the group will carry out its investigations. The campers will need to wade in the water. Therefore, the stream should be slow moving and shallow enough so that it does not present a danger to the students. Avoid ecological or environmentally sensitive areas such as waterfowl breeding grounds, sites where the shoreline is eroding, or areas with little or no shoreline vegetation.

A stream that has a very muddy bottom tends to become murky when campers work in it and poor samples are usually obtained. A slightly stony and pebbly bottom is a good choice. An ideal stream is anywhere from 5 to 35 feet wide and no deeper than 3 feet.

The length of this study will depend on how many parameters of the aquatic habitat you choose to examine. An hour-long session in the field, supplemented with hour-long preparation and follow-up sessions, is the minimum amount of time you should plan on using. Campers' enthusiasm in the field runs high and it is often difficult to maintain a time limit on this activity.

Building the Equipment

Materials

1. Plastic pails with handles (gallon size): Ice-cream, frozen fruit, or honey containers are also ideal. One for each team.

2. Sorting trays: White or light colored dishpans are best choice, shallow aluminum foil baking dishes such as TV dinner containers or pie plates may be used. Aquatic organisms show up well against a white background so if aluminum containers are used, the bottoms should be painted white, or cut heavy white cardboard to fit inside the container. Several large sorting trays are needed for the instructor with each team possibly using a smaller tray.

3. Old spoons or hand trowels (optional): One for each team.

4. Waterscopes: May be made from heavy cardboard cylinders about half a metre in length. Mailing tubes, stove pipes, poster or paper containers are ideal. If cardboard cylinders are used they will need to be waterproofed with polyurethane or a plastic varnish. A bottomless bucket is also useful. Cellophane or clear plastic is needed to fit over one end of the tube. Instructions for use and assembly follow.

5. Microscopes (optional): Magnifying lenses are more practical for use in the field. Strings should be attached so the campers can hang them around their necks. One for each team.

6. Eye droppers and basters: Two sizes are preferable.

7. Collecting Nets: Hand dip and flat-bottomed nets. Although one net may be shared between several teams, one net per team is desirable. Nets may be made from coat hangers, nylon stockings, cheesecloth, tape, and wooden stakes such as broken hockey sticks or broom handles. Instructions for use and assembly follow. Plankton and seine (minnow) nets may also be used.

8. Bottom samplers: For screening the bottom material an ideal collecting tool is a kitchen sieve or strainer. A hand screen may be used which consists of a piece of screen tacked onto a wooden frame. Each team requires one sieve. Instructions for the use and assembly of the hand screen follow.

9. Containers: Small containers such as empty tin cans. One for each team.

10. Rubber boots: These may not be necessary if weather conditions are suitable to allow campers to wade in the water in their bare feet.

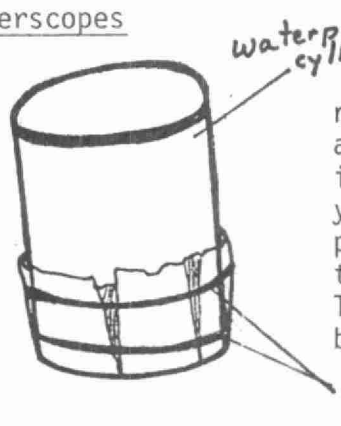
11. Clipboards, paper, and pencils: Clipboards of thin plywood or heavy cardboard with paper and a pencil attached are needed for each team.

12. Field guides: A general identification key will benefit the boys and girls while in the field. The Golden Nature Guides has a publication entitled Pond Life, which is ideal for identifying some of the more common life forms the campers will find. As it may not be feasible for each team to have a guide such as this, suggestions on how they could prepare one of their own before the field trip follows.

Assembly Instructions

Campers should be given time to construct the equipment on the camp-site.

Waterscopes



Several coats of plastic varnish will be needed to waterproof cardboard cylinders, if they are used. When applying the varnish brush it up into the inside surface of the cylinder as far as you can reach with the brush. Cut the sheet of plastic so that when it is placed over the end of the tube it will extend 5 or 6 cm. up the side. This can be kept tight and secure with elastic bands.

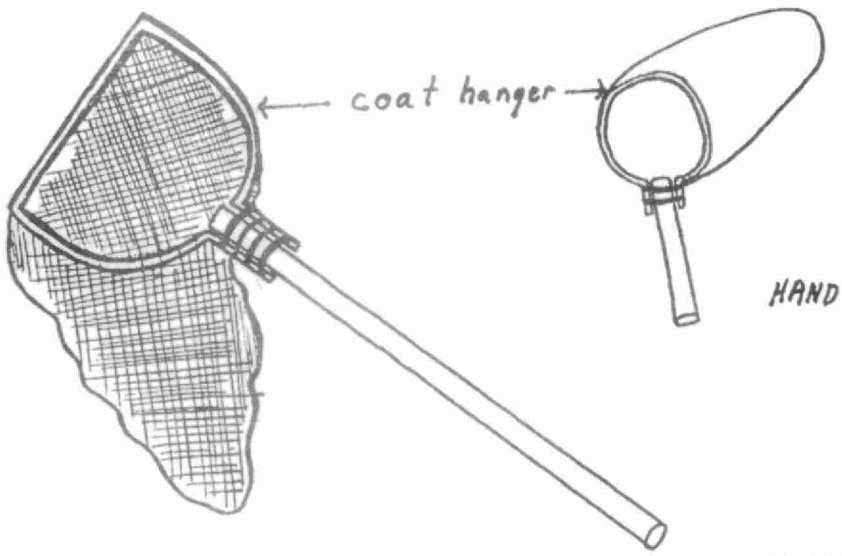
The waterscope may be used to look at the tiny animal and plant life on the stream bottom as it exists naturally. The pressure of the water causes the plastic to become a convex lense so that plants and animals appear larger than they really are.

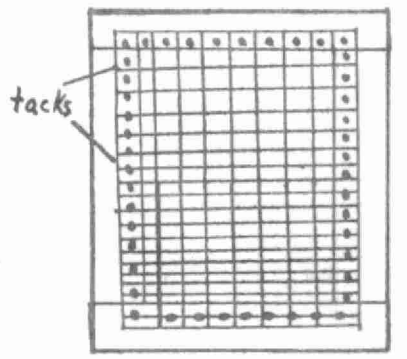
The success of viewing through the waterscope will depend on the brightness of the overhead sunlight and the clearness of the water.

Collecting Nets

Small hand dip nets are primarily used for collecting insects and other small aquatic life on the surface of the water, among plants, and under stones and logs along the shore. A circular frame is needed for attaching the net bag. Bend a coat hanger into a ring about 8 cm. in diameter. Make a net bag from organdy, nylon stockings, or cheesecloth about 12 cm. deep. Sew the bag onto the ring. Fasten the ring and bag to a stick or pole about 8 cm. in length.

A flat-bottomed net is used to collect larger aquatic organisms throughout the water column. Bend the coat hanger wire into a D-shaped frame about 35 cm. in diameter. Make a net bag from cheesecloth, nylon stockings, or netting of a 3 mm. mesh, about 60 cm. in depth. Sew the bag onto the frame. The frame and net bag can then be attached to a long pole of up to 90 cm. in length with tape. A broom handle or hockey stick is ideal.





Hand Screen

A frame can be built using pieces of wood about 30 cm. in length. A mesh hardware screen of less than 1 mm. is tacked onto the frame. Bottom mud samples are then dug up and placed on top of the screen. Water is poured over it washing the finer particles through. Large stones should be removed by hand.

Identification Guides

Before entering the field, the campers should be introduced to aquatic habitat concepts and the physical features of the stream should be discussed.

Illustrative drawings of the aquatic plants and animals should be made either on the blackboard or in poster form. Campers need to be made aware of what they may find and where to look. They could make up their own identification key and attach it to the clipboard. References such as the Ministry's educational fact sheet on "Aquatic Insects" could be used. (See identification section.)

It should be stressed to the boys and girls that they are only guests in the aquatic community and, therefore, they should return all specimens to the water as close as possible to where they found them. Overturned rocks should be replaced in the same position, and plants that are removed should be pulled up with the roots intact and replanted when observations are made.

FIELD TRIP ACTIVITIES

All of the following activities could be undertaken during one field trip or could be spread out over several visits. Although the sequence can be altered, a team should complete an entire activity before preceding to another stage.

A question guideline follows each activity. It is suggested that the campers answer these or other related questions designed by the instructor while they are in the field.

I Microscopic Pond Life

You will need lenses, basters, sorting trays, and clipboards. One of the most fascinating aspects of animal life involves the discovery of microscopic plants and animals in a sample of water. Most small children have not been exposed to these forms and are generally thrilled to discover them. The richest collections will be found early in the fall and again in the spring.

Using the baster, have the boys and girls suck up a sample of water from: (1) the edges of the stream or pond, (2) the scum on the surface of rocks or logs found close to shore, and (3) close to the bottom mud. Transfer these samples to separate small sorting trays on shore. Have the campers observe their samples with magnifying lenses and ask them to draw the specimens they see. When observations are completed, return the samples to the water.

Question Guideline

Do you see anything moving? What color is it? How fast is it moving? How does it move? Do you see other forms? Are they the same color? The same size? The same shape? Are they plants or animals?

II Small Aquatic Animals

You will need small hand dip nets, pails, small containers, sorting dishes and trays, clipboard, sieves, and waterscopes.

Insects and small aquatic animals will be found on the surface of the water, on and under plants, logs, and rocks, in the bottom sediment, and directly in the water.

Have the boys and girls look for insects such as the water strider on the surface of the water. Using the hand dip nets they can catch and put them in pails which are half-filled with water. Identify and record observations.

Using the hand dip net, sweep it through the water around rooted vegetation. Put any captured specimens into the bucket. Look under leaves of plants, such as the water lily, and along the stems of plants for insects. They can be caught with the net and transferred to a pail. Identify and record observations.

Have the campers turn over rocks and small pieces of wood in the water and, using the waterscope, look closely for any movement. Common forms such as the mayfly or stonefly nymphs and leeches may be found.

Organisms found on the rocks can be washed off by holding the rock over the pail, and pouring water over it gently. Identify and record observations.

Children are usually amazed to find living things in the bottom mud. They should be able to observe several organisms, particularly the bottom tube dwelling worms.

The campers can obtain a mud sample by either digging up the mud with the kitchen sieve or using spoons and placing it on the hand screen. Look closely for any movement. Fill the small container with water and pour it gently over the mud. Can you see anything? Pour several containers of water through the mud. The remaining sample can then be dumped into the pail (half-filled with water). The magnifying lenses may be of some help now if boys and girls fail to observe any movement. Note: many aquatic worms are small and are clear or have a very light coloring. Identify and record observations.

The small dip net can be pulled through the water, just below the surface and then closer to the bottom of the pond or stream. Contents of the net are then to be transferred to the pail for observation and recording. The waterscope may be used here to observe the life as it exists naturally in the water.

Question Guideline

How do the insects found on the surface of the water move? What do their legs look like? Do they make particular noises? Do they ever dive into the water?

What color are the insects found on the plants? Why would a plant be a good home?

What color are the organisms that are found on rocks? Why is this important? How do they attach themselves to the rock? Is the rock green and slimy? Why is this? Why would a rock be a good place to live? What differences do you see when the organisms are held in the air (only for a few seconds, we do not want to harm them) and when they are put back into the water?

What color are the organisms that were found in the mud? Why is this? What kinds of food would they find in the mud? Why is this? Where does it come from? Do you think these organisms could live on a plant or on a rock? Why not?

What makes the organisms which live throughout the water different from the other ones that were found on the plants? What do you think they eat?

III Large Aquatic Animals

An ideal tool for collecting small fish is the seine (minnow) net. If this is available for the group to use, an excellent fish study could be undertaken. The net needs to be unrolled and placed across the stream with floats up and weights down, allowing it to take a U-shape. Have several campers go upstream from the net and walk towards the ned moderately splashing and kicking to encourage the fish to go downstream into the net. Bring the net towards the shore keeping the weighted bottom tight as it is lifted out of the water.

Fish, crayfish, and large beetles may be caught and can be transferred to a pail full of water. Identify and record observations. A fish's scales have observable ridges which can be counted as growth rings. Return all captured fish immediately after observations have been made.

The flat-bottomed nets are successful for collecting large specimens. Have the children students sweep the net back and forth among water plants and along the bottom of the stream or pond. The campers can also walk upstream for a distance with the net dragging behind them, another camper can walk towards them. The net is then pulled up and the contents transferred to a pail. Identify and record observations.

Have the campers walk along the bank and look for any signs of animal life such as tracks and holes in the ground indicating a burrow. If the boys and girls anticipate viewing large animals such as racoons, muskrats, or turtles they may be disappointed. They will be very fortunate, if they do.

IV Plant Life

Have the campers examine plants from several distinct areas. Look for vegetation that is growing on submerged rocks and logs. Find plants that are floating or drifting in the water. Several species of plants that are rooted in the bottom mud and growing out of the water should be examined. Remind children that plants may be pulled up with the roots but will have to be replanted. Observe the plants growing directly next to the water on shore, several metres away and then about 20 metres away. Identify and record.

Question Guideline

What differences are seen between the plants? How are the plants adapted to their particular area? Are they all the same color? Do they all feel the same? Do they look different when they are taken from the water? Could the plants taken from the water live on the land?

V Physical Features of the Pond or Stream

Although physical parameters such as temperature, depth, width, and velocity could be studied by older campers, a general description of the stream is better suited to younger ones.

Have the campers record and describe the following characteristics:

1. What color is the water? Is it clear, light brown, or dark brown? Can the bottom be seen?

2. What does the stream bank look like?

3. Describe the surrounding country.

4. Estimate the amount of shade on the stream. Is it all shaded or half shaded? Why is it shaded?

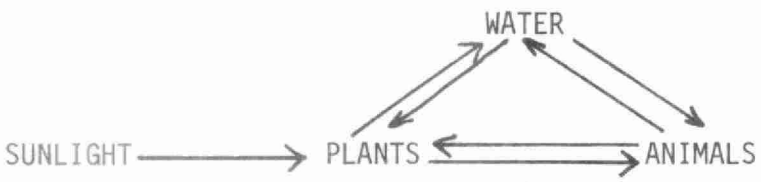
5. What is the weather like?

DISCUSSION OF RESULTS

As the teams may collect different samples, it will benefit the campers if the instructor takes the best samples from the campers' pails and transfers them to the large sorting trays. The campers can then take turns recording their observations.

At the end of the field work, the campers should share their thoughts and experiences on the aquatic environment with the rest of the group.

The group should think about the initial concepts that were covered at the beginning of the study. The following diagram illustrates interactions taking place in the aquatic habitat. The arrow represents the words, "interacts with".



ADDITIONAL ACTIVITIES

1. A classroom ecosystem could be constructed. Refer to the Ministry's educational fact sheet, "Constructing a Closed Ecosystem" in this manual.

2. A mural of the aquatic habitat could be drawn, painted, or constructed by the campers.

3. An essay could be written on a typical day in the life of a plant or animal that was observed in the stream.

CONSTRUCTING A CLOSED ECOSYSTEM

I INTRODUCTION

Construction and observation of a closed ecosystem can help the average camper develop many basic ecological concepts. What are the basic requirements of living things? Why is sunlight so important? How is oxygen produced? These are some of the questions a closed ecosystem can generate.

We, on earth, depend upon the continued reuse of air, water, and land much the same as astronauts are required to reuse the limited resources they take along on space journeys. Apart from the sun's rays that supply life-giving energy for plant growth, nothing else has to enter or leave the earth's biosphere to sustain life. For this reason the earth has been likened to a spaceship, and our planet has been referred to as spaceship earth. If life aboard our spaceship is to continue in a desirable fashion, we must pay more attention to the workings of the environment and the ecosystem in which we live.

But, ours is a complex system, mind-boggling in its total complexity. The closed ecosystem can provide a simplication of ecological processes for the purpose of initiating thoughts and discussions of greater importance and magnitude.

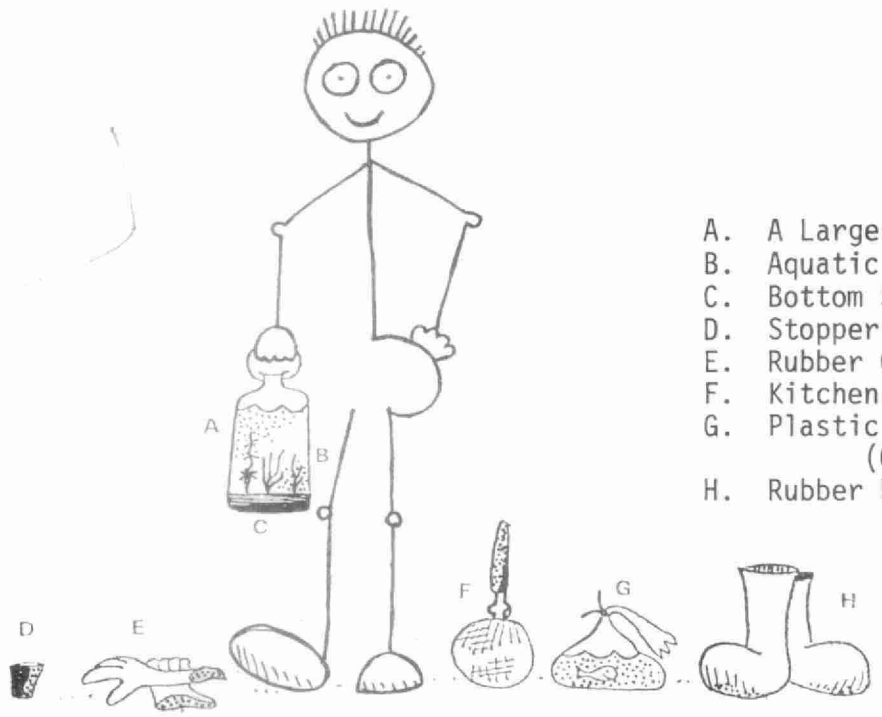
If we fail to grasp enough knowledge about the workings of our world -- our ecosystem -- problems await us. The price we pay may be great. Some have even said that pollution of our vital resources could threaten the very existence of many of the passengers on board spaceship earth.

II THE ECOSYSTEM CONCEPT

Ecology can be simply defined as the study of the relationships of living things to each other and their physical environment. In any given community there is always tremendous interaction between the living (biotic) and non-living (abiotic) components. The cyclic transfers between populations of plants and animals in a community and their non-living environment are implied in the term ecosystem.

What is an ecosystem? Why study one? Especially why study a miniature one is a bottle?

By building a miniature closed ecosystem one can actually witness the intricate workings of an interacting community relying only on the input of light energy for maintenance. The complexity of this system and the cyclical pattern of life will become apparent over a prolonged period of time. And, the beauty of it all is that once set up, no further work is required, just close observation.



A. A Large Bottle
B. Aquatic Plants (Algae)
C. Bottom Sediments
D. Stopper or Lid
E. Rubber Gloves (Optional)
F. Kitchen Sieve
G. Plastic Bag and Guppies (Optional)
H. Rubber Boots (Optional)

III CONSTRUCTION OF AN ECOSYSTEM

1) Obtain as large a bottle as possible (preferably one with a lid, or one that can be stoppered).

2) Clean the bottle thoroughly.

3) Visit either a slow-flowing stream or, preferably, a pond or lake shore. A site where aquatic plants are growing will probably yield a variety of aquatic life, both plant and animal.

4) Scoop approximately two to three inches of bottom sediment into the bottle. If there are aquatic plants (especially algae) at the site, obtain a portion of these. (A kitchen sieve will act as a net to catch tiny aquatic organisms that might live amongst the aquatic plants.)

5) Fill the bottle three-quarters full with water obtained at the site.

6) Return the bottle to the camp and place it on a window ledge (preferably a south-facing window) where sun will shine on it at some time in the day. Allow the contents to settle overnight.

7) If aquatic plants could not be obtained from the collection site, a visit to a local tropical fish store will be necessary. Purchase a few strands of an aquatic plant such as Canada Water Weed (Elodea). If you haven't obtained some snails in your original sample then it might be wise to purchase some of them as well. If you want fish in your ecosystem, three of four small guppies might be purchased. (Remember, the guppies will eat some of the other life.)

8) Carefully insert the aquatic plants into the bottle and secure them in the bottom sediment (if necessary by tying them to a weight such as a stone).

9) If guppies are added to the system, they should first be placed in a plastic bag. The bag and contents should be placed in the ecosystem so that the water temperature in the bag has a chance to gradually become the same as the water in the ecosystem. This is necessary or the fish might suffer from temperature shock and die. After several hours, release the fish from the bag into the larger container.

10) Place a lid on the bottle, but don't seal it.

11) After a few weeks, when the system is functioning and appears to be in some sort of balance, the bottle can be sealed by melting some paraffin wax and applying it around the lid or stopper so that no air can enter or leave.

IV OTHER THINGS TO CONSIDER

1) If time is not a factor, (and it shouldn't be) allow the system to adjust to the light source for several weeks before adding guppies.

2) If space and time is available, set up some experiments, using other bottles to illustrate various ecosystems. For example, you can add or subtract components of the system. More guppies can be added in a second bottle, or sediment might be excluded from a third bottle. Using the one ecosystem as a control, it is possible to see how each of the various components are important to the 'balance' that eventually is established.

3) If chemical testing equipment is available, and the ecosystem has not been sealed, it is possible to test on a weekly or even daily basis the chemical nature of the water. Oxygen, carbon dioxide, and pH levels might be determined and graphed over an extended period to see what changes occur.

V QUESTIONS

1) After obtaining definitions for each of the following terms, explain how each applies, or is represented in, your miniature ecosystem, giving examples in each case.

   a) biotic factors
   b) abiotic factors
   c) producers
   d) niches
   e) consumers
   f) food chains
   g) nutrients
   h) herbivores
   i) carnivores

2) Devise experiments to illustrate (using your mini-ecosystem):
   a) the importance of sunlight
   b) the possible consequences of organic pollution
   c) chemical pollution
   d) the effects of phosphates on algae
   e) the importance of snails in an aquatic ecosystem
   f) the effects of dairy waste on a natural pond ecosystem
   g) the effect of eroded soil on a pond ecosystem.

ACTIVITIES FOR THE WASTE CONSCIOUS

The following are a selection of activities on waste that can be used by the camp leader for educational purposes and to clean up the campgrounds.

HAVE PEOPLE BEEN HERE?: On an undeveloped portion of the camp, children should show "three kinds of direct or indirect evidence that people have been there". Encourage originality. Most campers will choose litter as direct evidence. List as many examples as possible.

PAINT A CAN: Trash cans are almost as unsightly as the litter put into them. Divide your campers into small groups. Give each group a trash can, some brushes, and paints, in several colors. Have a trash can decorating contest. Involve the entire camp by letting them vote for the trash can of their choice. Distribute the cans throughout the grounds.

TRASH COLLAGE: Have your boys and girls collect for the camp. Allow the campers to select pieces of the collected trash and construct a collage. The collage can be mounted on plywood, beaverboard, or masonite for a permanent classroom display. The resulting "pop art" can be titled, "Pollution -- Is It Necessary?". Dispose of the rest of the trash in a suitable way.

LITTER SCAVENGER HUNT: Compile a list of common litter items about the camp for a scavenger hunt (against time). List items such as ten cigarette butts, two chocolate bar wrappers, one cigarette pack, one bubble gum wrapper, etc. A survey walk of the grounds should present ideas for the items listed.

LITTER RUN: Take your group outdoors and divide into two teams. The object of the race is to see which team can pick up the most litter in the shortest time. When the signal is given, the first person in each team must collect three pieces of litter and then run back to his team. The litter must be deposited in a garbage bag. Once the first person has completed his task, number two in line must collect three pieces of litter, and so on. The first team to finish is the winner. The races may be varied by having campers hop on one foot, skip, or walk sideways.

TREE IDENTIFICATION

In this session, campers will be exposed to the local trees and attempt to identify them. Teams of three will work together. Each team will need some kind of an identification key. This key may be made beforehand by using a nature guide for trees and recording the common species' leaf shape, type of bark and name in a notebook. See tree classification chart in identification section.

EQUIPMENT

1. Notebook and pencil with identification guide (one for a group).
2. A metre long stick (one per group)
3. Compass (one per group:optional)

PROCEDURE GUIDELINES

Two different approaches can be used in this study depending primarily on the availability of compasses.

Method 1:

If you are not able to use compasses, you will have to spend some time before the activity begins, marking trails.

To mark a trail use bright colored ribbons or string. Tie them around trees leaving about 6 to 8 metres between each one. (The reason the trees need to be marked is so the campers can walk in a straight line heading in a chosen direction, for example, north. The direction will be decided upon beforehand by the leader who will also give the campers a location to stop, say, for example, when you reach the corn field or the cow pasture.) The team heads out with the navigator in front looking for the marked trees. The stick person follows behind holding a stick horizontally at waist height, stopping every time the stick hits a tree. He/she yells "stop" and the navigator and the recorder go to the tree and, using the key, identify it. The recorder records the name in the notebook. The number of marked trails will depend on how many are participating in the study. Separate the groups by at least 6 metres to avoid distractions and confusion. Try to arrange that each group has to identify approximately the same number of trees.

Method 2:

When using compasses, the navigator keeps the team walking in a straight path, in the pre-selected direction, by following the pointer on the compass. The stick person and recorder follow and proceed as outlined in Method 1.

In the case of a tree which cannot be identified, one leaf may be taken or a picture of it drawn in the notebook to be examined at the end of the outing by the leader.

Often a certain species will be very abundant in a woodlot with the team constantly recording it. In this case, the most abundant and dominant species will be discovered. Have the recorder check off the tree even if it has been previously recorded so that the total number may be added up at the end of the activity.

With older campers the diameter of the trees may be taken by using a tape measure, ruler or with a piece of string with known divisions marked off on it. From this information, the students will get some indication of the ranges in size and therefore the different ages of the trees.

At the end of the study the teams can tell their results to the others. A discussion on why some groups did not find the same trees may result.

An ideal study would involve the campers being exposed to roughly ten different species.

ADDITIONAL ACTIVITIES

1. Examine the area below a tree for seeds or young saplings. How did they get there? Are the young trees of the same species?

2. Locate a tree stump and study the growth rings. Why are some rings further apart than others? Why would a tree grow faster and larger only in some years? What does a tree need to stay alive?

3. Climb a tree. Be careful not to break off many branches. Can you feel the tree move when you are in it? Why is it moving?

TREE CLASSIFICATION CHART

By carefully recording the different characteristics of the trees you find and then looking up the name in a guide book when you return home, you can learn to distinguish one tree from another. This form could also be filled in by children before a field trip and used as an identification chart. In this case, however, the adult should list the names of the trees that may be found in the area.

Shape	Bark	Leaves	Buds	Flower	Fruit	Outstanding Features	Name
 limbs reach upwards	Vertical light and dark	 pointed tips	In a cluster and pointed 	Long drooping cattails 	Acorn 	Shallow acorn cap longish nut	Red Oak
	Peeling scaly		Large egg shaped 		Nut 	Shaggy bark	Shaggy bark hickory
							Sugar Maple
							Birch

Note: Obviously, the seasons will influence which columns can be filled in.

LITTER STUDY

PURPOSE: The purpose of the litter study is to demonstrate:

(i) the environmental problems created by garbage disposal;

and (ii) the solutions to these problems;

This study is suitable for campers 9 - 12 years of age.

TIME ALLOTMENT: One hour.

EQUIPMENT REQUIRED: See specific demonstrations for equipment required.

VOCABULARY:

DECOMPOSE: to rot, break down

NATURAL RESOURCES: materials found in nature that man uses in his everyday life. They include trees, water, air, wildlife, fish, minerals, oil.

NON-RENEWABLE RESOURCES: are natural resources which are limited in supply (e.g. oil, minerals).

RECLAIM: developing a new use for something which would otherwise be thrown out (e.g. use of old truck tires for swings on a playground).

RECOVER: a new phase in the solution to problems of garbage disposal. A RESOURCE RECOVERY PLANT to handle bulky items like refrigerators, stoves, and other appliances beyond repair; plastics; cardboard; etc.

RECYCLE: to use something over and over again (e.g. bottles, newspapers).

REDUCE: to decrease the amount of garbage produced by not using "throw-away" items like paper cups and plates, paper lunch bags, disposable flashlights, lighters, etc.

RENEWABLE RESOURCES: with good management, there will always be a supply of these natural resources (e.g. fish, wildlife, trees).

REUSE: materials which are used again by others for their original function rather than thrown away.

PROCEDURE: An introduction to this study can be enhanced by showing a film on litter. Films of this type may be borrowed from the National Film Board or from a public library.

A discussion could begin by asking the question: What is garbage?
Garbage is made up of things which people do not want any more.

Where does garbage go?
Trucks collect the garbage from our homes, schools and businesses.

Where do the trucks take it?
One place they may take the garbage to is a sanitary landfill site. (Note: Garbage dumps have been phased out of existence throughout most of Ontario.)

What is a landfill site?
A sanitary landfill site is where garbage is dumped and then covered over with soil every few inches and every night. When the site is completely filled it can be landscaped and used for recreational purposes.

What is wrong with landfill sites?
Landfill sites use up land that could have been used for building. The garbage burried at these sites often contains non-renewable resources, which could have been reused or reclaimed.

Demonstration: Sanitary Landfill Site Simulation

Equipment required:

- large empty jar with lid
- soil
- garbage containing items such as aluminum foil, saran wrap, paper candy bar wrapper, banana peel, cigarette butt, etc.

Simulate a sanitary landfill site by alternating layers of garbage with soil. Make sure the garbage is placed at the side of the jar where it can be seen. A list should be made of the items in the jar and the number of days or weeks that the campers believe it will take for each item to decompose. Observations should be recorded on the rate of breakdown, then compared with the campers/ estimated times.

Although a sanitary landfill site may look better, the resulting hill/site may only be used for recreational purposes. Many of our natural resources are being lost. For example, the disposed aluminum foil is an example of the important metal, aluminum, being lost.

Where else might the garbage be taken?
Sometimes it goes to an incinerator.

What problems are created by burning our garbage?
It pollutes the air by the smoke and odours created by burning garbage. We still have the ashes to get rid of. Valuable resources are still being wasted. For example, the large amounts of newspapers that are being burned each day is a waste of our valuable timber.

Demonstration: Simulation of an Incinerator

Equipment required:

- aluminum pie plate
- rubber band
- paper
- matches

urn the rubber band and paper over the aluminum pie plate. Allow the campers to observe the remaining ashes and to smell the burnt rubber.

What else can be done with our garbage?

(a) One answer is to reduce the amount of garbage that each one of us produces. Have the children suggest ways we can reduce the amount of garbage we make. Ideas could include:

- use less packaging
- avoid disposable articles (e.g. lighters, flashlights, paper plates and cups)

(b) Some materials could be recycled rather than thrown away. Bottles and newspapers are two items which are being recycled now. Have the campers make paper.

(c) Some materials may be reused by other people once we no longer have use for the article. Appliances, toys, clothes, books, etc., all fall into this category. Start a "reuse" scrap paper box.

(d) Some materials may be reclaimed. This solution to garbage disposal problems requires the most ingenuity. An example of reclaimed waste is tires from automobiles to be used in playgrounds for swings, or baby food jars to be used as paint bottles.

The solutions to the garbage disposal problem discussed above are ways which each one of us can do our part to eliminate this problem. There is also another method:

(e) Recover -- the purpose of the Ontario Ministry of the Environment's Experimental Resource Recovery Plant. By mechanical means it recovers materials such as plastics, cardboard, glass, metal, etc. from the garbage and is investigating markets to resell the materials. After the operations at this experimental plant in Downsview, Ontario have been thoroughly tested, similar plants will be built around the province.

CONCLUSIONS: The solutions to our garbage disposal problem are the 5 R's: Reduce, Recycle, Reuse, Reclaim and Recover. These solutions to garbage disposal: (i) do not pollute our environment; (ii) save space which otherwise would be required for garbage disposal; and, most important (iii) save our valuable resources.

FOLLOW-UP ACTIVITIES:

Younger children:

(i) Draw a poster
(ii) Make a collage from pieces of litter collected.
(iii) Make a skit or song about garbage. Present it to the rest of the camp at campfire.
(iv) Litter Scavenger Hunt: Divide the children into teams. Give each team a list of common litter items and a limited time to find them. The team to find the most items on the list wins.
(v) Litter Relay: Divide the children into teams. One camper at a time must run out, pick up a piece of

litter and return to throw it in a trash can before the next camper can go. The first team finished wins.

(vi) Litter Frequency Study: Take a walk with the campers and collect all the litter along the route. Return to the room.

a) Classify the litter according to the material from which it is composed, i.e.: paper, glass, metal.

b) Determine the frequency of each type: i.e.,

$$\text{frequency of glass} = \frac{\text{number of pieces of glass}}{\text{total no. of pieces of litter}}$$

c) Discuss how the more common items can be reduced, reused, recycled, reclaimed.

(vii) Reduce camp garbage: Weigh the amount of garbage produced each day by the camp. See how low you can bring the weight down.

(viii) Reuse camp garbage: Leave a scrap peper box in the arts and crafts room.

(ix) Reclaim camp garbage: Build a compost bin (see Page 13 in the Soil Study).

(x) Recycle camp garbage: Recycle paper and use it for art work or stationery.

Older Children:

(i) Litter-map: Divide the campers into 2 teams. Have each team draw a map of the area, marking each piece of litter spotted on the map. At this point, the team does not collect the litter. The teams switch maps and locations (i.e. team B uses team A's map to locate litter). The teams collect the litter.

Two points are awarded for every piece of litter found at the location marked on the map.

Minus one point for pieces of litter found without a location being marked on the map.

i.e.: Team B found 3 pieces of litter where Team A had marked it on the map but found 1 piece which they had not marked on the map. Therefore, team A received:

$$\begin{array}{rl} 3(2) = & 6 \text{ points} \\ -1 \quad & -1 \\ \hline & 5 \text{ points for Team A.} \end{array}$$

(ii) Suggest ways by which garbage may be reclaimed at the camp.

References:

- Ministry of the Environment - Information Services Branch
  Solutions to Pollution - The Antipollutes of Donber Creek
  - a coloring/story book for younger children.
- Ministry of the Environment - Information Services Branch
  The Glut - A Real Life Horror Story

FIELD & FOREST STUDY

INTRODUCTION

In this activity, campers encounter different communities of life, as illustrated in the outdoors. By exploring an area of a field or forest for plant and animal life and by looking at the physical factors, children should become aware of the interactions between these components.

The field work is most suitable for 2 - 4 children working in one quadrant with a maximum of fifteen students working under one instructor. The concepts and activities presented are merely suggestions and should be adapted to the age level of the campers.

Time allotment: 1 - 1½ hours.

Equipment Required:

- tent pegs or wooden stakes and string for constructing a 1 m^2 quadrant
- thermometer - for measuring air temperature
- magnifying lenses - 1 per group (optional)
- meter sticks
- campers' Field & Forest Study Sheets - 1 per camper (see Appendix I)
- Counsellor's Group Comparison Charg (see Appendix II)
- Clipboards and pencils

Vocabulary:

ADAPTATION: is a response by an organism to a physical stress in order to improve its chance of survival. For example, the thistle is adapted to growing in dry locations as it has spines on the leaves and stem which help to prevent water loss.

ANGIOSPERMS: are plants having their seeds completely enclosed by plant tissue. For example, apple seeds are completely enclosed by the edible tissue.

ANNUALS: plants that complete their life cycle in one year. They grow, produce flowers, produce and release seeds, then die. Next spring, only the seeds of that plant will grow. Most of our weeds are annuals, e.g. dandelion.

COMMUNITY: a group of plant and animal organisms living together and with their physical environment. For example, one community may be the plants and animals found living on a rock boulder.

GERMINATION: an initial stage in plant development when the seed begins to grow.

GYMNOSPERM: plants whose seeds are not completely enclosed in plant tissue. For example: pine trees are gymnosperms. Their seeds are not completely enclosed within the pine cone.

HABITAT: a specific kind of environment occupied by an organism, such as the squirrel which lives only in a deciduous forest. The trees' dead leaves are used to build its nest and the nuts are used for food.

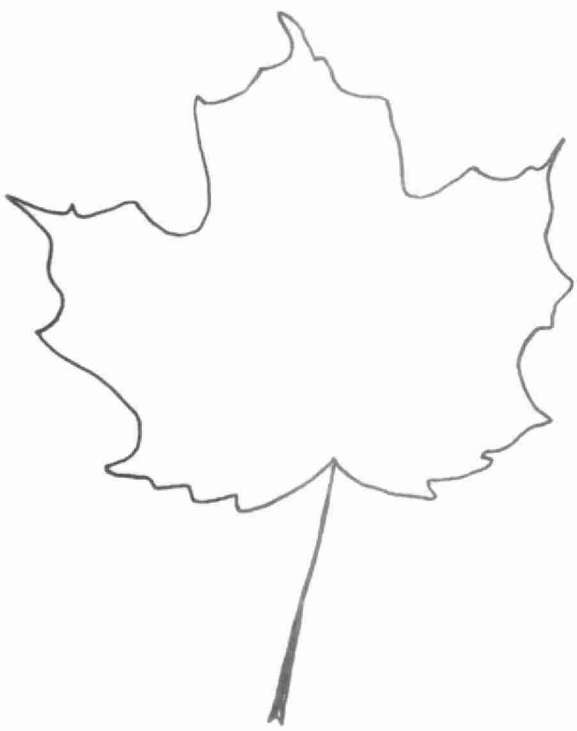
PERENNIALS: plants which continue to grow year after year. Although the plant may continue to lose its foliage in the fall, the same plant will produce new leaves the following spring, like the maple tree.

PHYSICAL FACTORS: includes light, temperature, water, atmosphere, wind, fire, gravity, topography and soil, conditions which affect where an animal may live.

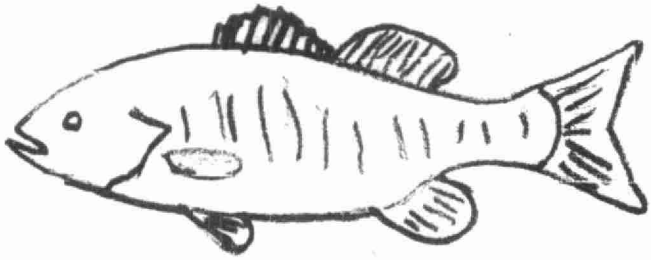
POLLINATION: the transfer of a flower's pollen grains from the male organ - the stamens, to the female organ - the stigma. Pollen grains may be transferred by insects, wind, birds, etc.

QUADRANT: an area of land, for example, one square meter.

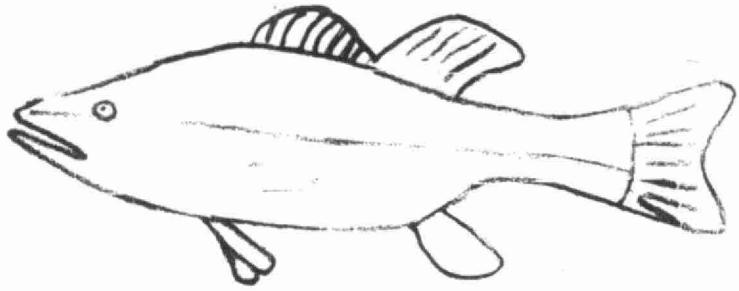
SPECIES: is a group of individuals (plants or animals) which are closely related and thus appear similar. For example, the leaves below are both from maple trees. But one is from the sugar maple tree and the other from the silver maple tree. These are two species of maple trees (Sugar and Silver).



Similarly, you are probably familiar with two species of bass - largemouth and smallmouth bass. As their names suggest, the two species differ in their mouth size and striping.



Smallmouth bass



Largemouth bass

SPECIES DIVERSITY: is the number of species found at a site, for example, if the number of species found in a 1 meter square or quadrant from an old field was compared with a quadrant from a coniferous forest, one might find more species present in the old field.

Old field	Coniferous forest
Canada goldenrod	Balsam fir tree
Common mullein	Hemlock tree
Common St. Johnswort	Bunchberry
Ox-eye Daisy	
Canada Thistle	
Orange Hawkweed	
6 species	3 species

The old field is said to have a greater species diversity since it has more species present per square meter than the coniferous forest.

SUCCESSION: is the long range change in the animal and plant species present at a site. For example, in time sand dunes may be colonized by several grass species, wild flowers, some shrubs and eventually trees like poplar and oak may begin to grow there.

BACKGROUND INFORMATION FOR CAMP COUNSELLOR

This segment has been included to assist the counsellor who has a limited science background to deal with some of the topics of discussion which may arise during this study.

In the following section the vegetation, animal life and physical factors of three communities are compared. These communities are: An old field, a deciduous forest and a coniferous forest. The section should provide some insight into the interactions occurring between the physical factors and the plant and animal communities exisitng in the area.

I. VEGETATION

a) Vegetation of an old field: In an old field, you will find many kinds of wildflowers. There is sufficient sunlight to provide energy for the plants to grow, produce flowers and release seeds during the short summer period. (See flower structure in Chart I)

Pollination by wind or insects is common in an old field. Colorful flowers and sweet-smelling nectar attract the insects to a plant. Although the insect receives food (nectar and/or pollen) from the flower, the main reason the plant tries to attract insects is for its own survival. In moving from flower to flower, the insect transfers pollen from the stamens of the first flower to the pistil of the second -- thus pollinating or fertilizing the flowers.

Where wind pollination occurs, it is not necessary for the plant to have a colorful flower or smell. Grass is a wind-pollinated plant. Long, protruding stamens bearing an abundant load of pollen facilitates wind pollination. The fine, flexible structure of the grass allows it to bend easily and rub against adjacent plants to transfer the pollen.

The seeds of plants in an old field are usually dispersed by wind or animals. Seeds dispersed by wind are generally very light to increase their distribution over a greater distance (e.g. dandelion seeds). Animal-dispersed seeds usually bear some structure which enables them to cling to an animal (e.g. the hooks on a burr).

Plants in an old field are often subjected to dry conditions and large daily temperature fluctuations. The plants have structures which help to protect them from the abofe factors. For example, many plants have a thick, waxy coating on their leaves or stem to help reduce water loss. Hairs on the leaves and stem also help to reduce water loss by creating a dead air space or insulating layer. (e.g. milkweed). These plants are siad to have adapted to their environment.

Plants of an old field, such as golden rod, fireweek and common mullein, are often termed pioneer species in succession. They are the first species to establish themselves in a recently disturbed site.

b) Deciduous or c) Coniferous Forest

In a deciduous or coniferous forest setting, fewer annual wildflowers will be found than in an old field, as the plants cannot receive sufficient light energy. Instead, perennials are more prominent.

Trees and other forest plants usually flower in the early spring before the leaves of the trees appear. In this way, the forest floor can receive sufficient energy from the sun to support reproduction. The absence of leaves also enables wind pollination to occur. For example, maple tree flowers are out in spring before the leaves. Pollen from the male flowers fertilize the female flowers. By September of that year, the seeds are ready for dispersal.

Seed dispersal is by wind and animals for trees and by animals for smaller forest plants. The seeds of forest plants usually require a longer germination period since they receive less sunlight than seeds of a field plant. Often the forest seeds are larger so they may contain a larger food reserve (e.g. acorns).

The forest canopy protects underlying vegetation from large temperature fluctuations and from drying out. Thus, structures to deal with these physical stresses are missing from forest species.

The cool, shaded forest provides an ideal habitat for moss and fungi growth. Fungi are useful for breaking down dead vegetation to return the nutrients to the soil.

In terms of succession, the final or climax stage of succession is a self-perpetuating forest (e.g. a beech-maple forest in central Ontario).

II. ANIMAL LIFE

Insects can be found associated with particular plants. The color and structure of a flower may be adapted to attract a particular insect species. For example, red flowers having a flat top would attract butterflies only. The color red is attractive to butterflies and the flat top structure enables the butterfly to perch on the flower to collect nectar. Neither bees nor hummingbirds would visit such flowers. Why? Bees cannot see red, so they would not be attracted to that color of flower. Hummingbirds must hover over a flower while collecting nectar. A flat top flower such as Queen Anne's Lace, would prevent a hummingbird from collecting nectar in this fashion.

Various insect species occupy different habitats. While one species may live close to the ground on a tree, another species may live on the ends of the foliage. Species living in different habitats help reduce competition among themselves for space and food. Occasionally, an animal may occupy the same habitat as another, but will be active at a different time of day (e.g. moths at night, butterflies during the day).

Often the insect species is colored to blend in with the surroundings of its habitat, such as a green grasshopper which blends in with the grass where it is normally found.

An insect's structure is often adapted to its habitat. Organisms such as the earthworm, living in the moist soil of the forest, often have moist skin whereas organisms found in a drier habitat have a thick, hard outer shell, like beetles, to prevent drying out.

III. PHYSICAL FACTORS

lant and animal communities will differ where the physical factors are different.

In an old field, large daily temperature fluctuations occur. Organisms from an old field are exposed to more light, wind and periods of dessication (drying out) than organisms from a forest. Only plants and animals tolerant of such harsh conditions can grow in an old field.

Soil is another physical factor which will determine whether a plant or animal is found at a site. Soil from a coniferous forest is more acidic than soil from a deciduous forest, due to the decay of the acidic pine needles. Only plant and animal species tolerant of this type of soil can live in a coniferous forest.

ACTIVITY

Upon arriving at the site, the counsellor sould begin the activity by explaining that the campers are going to examine this site in great detail, using four of their senses to do so - sight, sound, touch and smell. The campers will be working in small groups studying only a small area called a quadrant. The counsellor should demonstrate how to set up a quadrant (instructions are given at the end of this study).

Explain: What to look for, what characteristics to measure, what to record.

Ask the campers: (a) What kinds of things will we find in the quadrant?
(b) What kind of animals will we find on the ground, in the ground or flying over the ground?

List the campers' responses on a flip chart or blackboard for later referral and comparison. In this way a discussion can be centered on why all things may not be able to exist in one area.

The campers should then be divided into groups of 2 or 3 and the equipment distributed. Either allow the boys and girls to pick their own study area or assign them to a specific location.

It will be more beneficial to the campers if the quadrants under study differ in some way. Quadrants that vary in the obvious physical factors will reveal different animal and plant communities.

After the campers have set up their quadrant, distribute the study sheets (see Appendix I). The counsellor should visit each site to assist any campers having difficulty completing the chart.

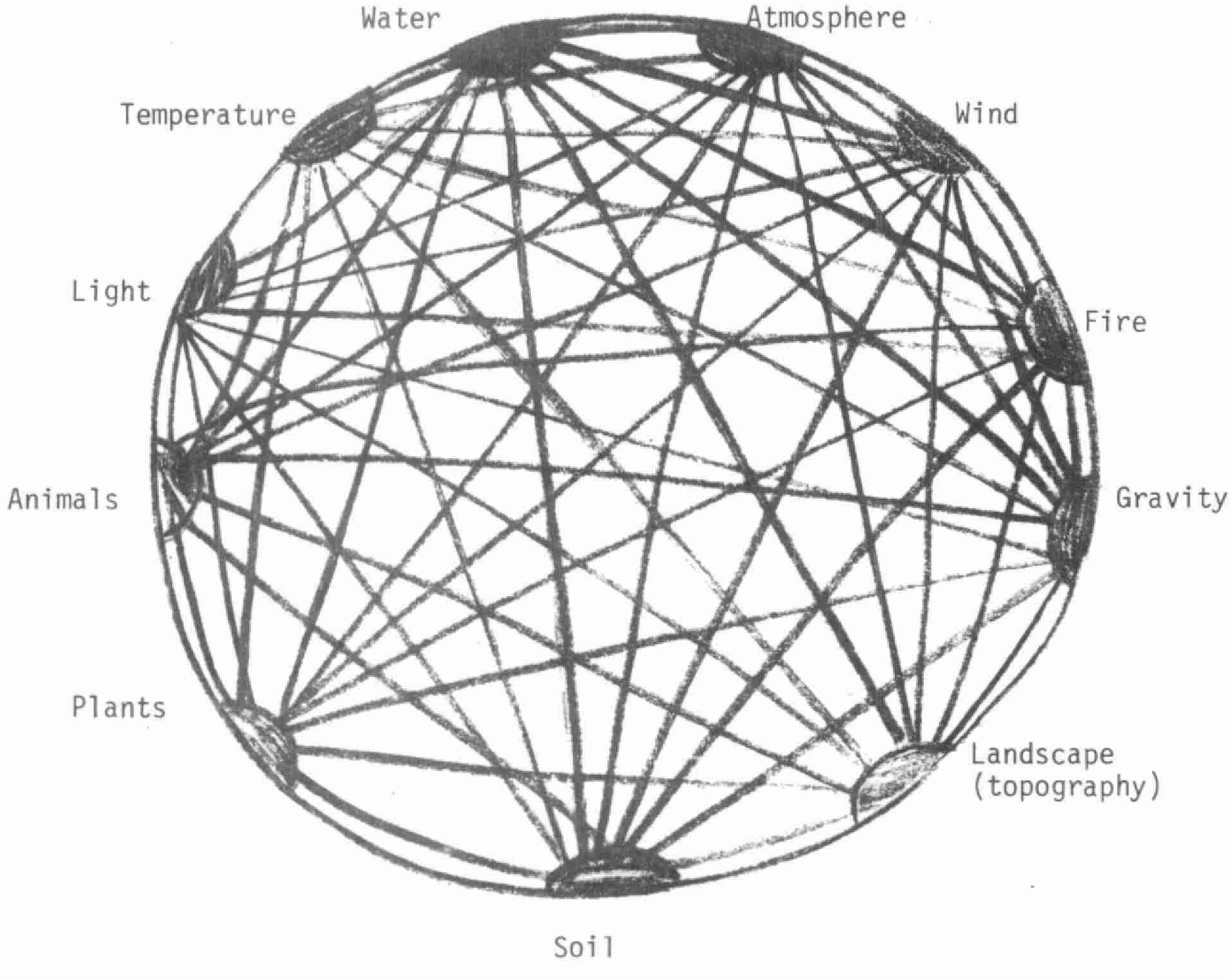
After the field work has been completed, the quadrants may be compared and discussed amongst the entire group. See Appendix II for a sample group chart.

SUMMARY

The model below illustrates the interactions occurring between physical factors, animals and plants. Different combinations of each of the components of the chart will define different communities.

SUMMARY CHART

INTERACTIONS BETWEEN ANIMALS, PLANTS AND PHYSICAL FACTORS



GAMES

As a summary activity, campers could form the circle, each camper being given a card stating which animal, plant or physical factor he or she is.

Have one camper hold the end of a ball of string (i.e. starting with the child holding the soil card) and ask him/her to name something in the circle that is affected by soil. Extend the string to the person holding that card and ask him/her what factor he/she affects. Extend the string. Continue.

Similarly, a circle and the components of the circle can be drawn on a chart and campers have to draw the lines between interacting components.

FOLLOW-UP ACTIVITIES:

Using the summary chart on Page 45, discuss:

a) the effects of man's activities on the components of this chart. For example, automobiles and industries are major air polluters. Sunlight has difficulty filetering through the smog particles. The plants, as a result, receive less energy, so they might not grow as tall, or might not reproduce. This means there is less food for animals.

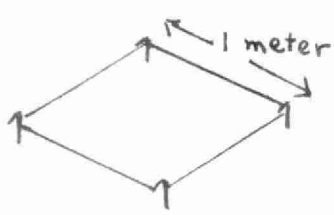
Consideration may be given to the effects of water pollution, pesticide and herbicide application, thermo-nuclear pollution, fire, etc.

b) Draw a food chain using the organisms found in the quadrant.

References: Terrestrial Ecology - W.A. Andrews, Prentice-Hall Publishers, 1972.

Setting Up a Quadrant:

1. Using the meter stick, measure out 1 meter on the ground.
2. Push a tent peg into the ground at either end of the meter stick.
3. Pick up the meter stick and lay it down at a 90 degree angle from the previous peg.
4. Repeat previous steps until all 4 pegs are positioned.
5. String can be tied between all the pegs to complete the quadrant.



APPENDIX I

Campers' Field & Forest Study Chart

Site: _____

Vegetation:

Plants present: tall, low, bushy, creeping, trees, grass, moss, other: _____
Ground cover: bare, sparse, thick, other: _____
Colors Present: _____

1. Is grass present?
   Is it all the same height and shape? Describe it: _____
   Does it smell?
   Are trees present?
   How many conifers are present?
   How many deciduous trees are present?

2. Is dead or decaying vegetation present?
   Why is it important?
   Are there any plants growing on the dead or decaying vegetation?
   What color are they?
   Why are they growing there?

3. Are seeds present?
   How did they get there?
   Where did they come from?

4. Are wildflowers present?
   Are they in flower or in seed?
   Do the flowers have a smell?
   Why is this important?
   What color are the flowers?
   Why is this important?
   Are there hairs or spines on the leaves or stems of the wildflowers?
   Why might the hairs or spines be present?

Animal Life:

Animals present: bees, wasps, flies, ants, beetles, spiders, other: _____
Are they moving?
Can you find the same animals in both short and long grass?
Can you find the same animal in another color?
How are the animals adapted (suited) to their environment?
What sounds can be heard?
What evidence of animal life such as worm castings, worm holes, spider webs, ant hills, can you find?

Physical Factors:

Terrain: open (no tree canopy), closed, flat, rolling, steep
other:_____
Temperature: sunny, shaded, hot, warm, cool, other:_____
at ground_____ Four feet above ground_____
Wind speed: windy, breezy, calm, other:_____
Wind direction: N, S, E, W
Soil: wet, moist, dry
Are rocks present?
Particle size: small, like silt; large, like sand
Color:_____

APPENDIX II

COUNSELLOR'S GROUP COMPARISON CHART

SITE	ORGANISMS FOUND	NUMBERS

HIKING IN NATURE

Nature hikes can be exciting adventures for both campers and leaders. But you as a leader will have to encourage this spirit! It is wise to hike over the area you plan to use before taking the campers out and to familiarize yourself with the local flora and fauna. You may come up against rough terrain, swamps, or very dense shrub and bush growth, which you may want to avoid.

Hikes do not have to be one time outings. Experience the woodlot or the beach before breakfast when the sun is rising or after dinner when the sun is setting. Avoid long hikes on very warm days or around mid-day when the sun is the hottest. Advise the children to wear shoes that will protect their feet as well as ones that will stay on (no thongs, please) and loose, light clothing.

As a leader you do not have to be a naturalist to lead this hike. Being able to rhyme off the names of all the animals, plants, trees, birds, and insects is nice but not nearly as important as being able to get your campers to see, touch, or smell the environment. Children will never remember the names of all the things they see but they will remember how nice a flower smelled or how rough a piece of bark felt.

PROCEDURE GUIDELINES

Begin the hike by reminding the campers that we do not pick wildflowers, break branches from the trees, crush toadstools and mushrooms, destroy spider webs, or step and run through the woodlot without looking out for the tiny, new trees that are trying to grow in the soil...In other words we are going to be quiet, courteous, and aware that we are guests here. All we will leave along the way are faint footsteps. A single file following the leader has the least impact on the environment.

The general approach that will be used is frequent and short stops along the way which will depend on the campers' interests and their attention span. When do I know when to stop? Stop every time you notice well-known trees, plants, insects, unusual patterns or designs in tree bark, animal homes, birds, and bird nests, animal tracks, or feathers. In other words, point out to the campers the world they are living in.

Look for colors, light, and shadows. Look for size comparisons like a tall tree and a tiny seed; a camper, and an ant. How many different shapes of leaves can we see? Are there any baby trees growing along the trail? Are they the same species as a nearby large tree?

With the sense of touch, feel lichen growing on a tree and compare it with the feeling of moss. Feel the bark of several different trees. How is it different? Describe.

Smell the leaves on the ground. Then smell the leaves from a nearby bush. Do they smell the same? Why not?

How much light is coming through the trees? Let us lie down on our backs and imagine we are baby trees trying to find the sunlight. Is this a good place to grow? Try and find a better home.

For the sense of hearing, listen for bird calls, wind, and rustling leaves. Which sound is the loudest? If you were a rabbit, where would you want to hide along the trail? Let us pretend for a moment that we are going to move into the forest, where would you make your home? How many different kinds of insects can we find on the bark of a tree? How many can we find on the ground underneath the tree? Look underneath rocks for life but remember to turn the rock back over the way it was.

Allow the campers to explore and no doubt you will be surprised at how observant they become. Let them tell their adventures to the other campers and to point out their precious finds.

Try to walk through contrasting environments such as an open field in comparison to a dense woodlot; a swampy area and the beach; along a road in comparison to along the forest's edge. These diverse habitats will maximize the possibilities for an enjoyable and happy hike.

WEATHER STUDY

Introduction:

"What's the weather supposed to be like today" is a question that most of us ask every day, since weather determines what we wear, do and even how we feel. But what is weather? What causes the weather to change? Through activities, the weather study will answer these questions and outline how children may construct their own equipment for monitoring weather.

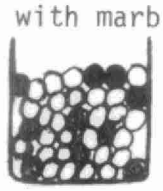
Time Allotment: 1½ hours.

Weather is made up of air pressure, heat, wind and moisture. The interaction of these components determines the weather we experience. We will examine each of these components separately.

AIR PRESSURE: Air - although all children have heard the word air, they're probably unable to describe it other than "it's what we breathe".

1. Have the campers inhale deeply through their nose so they can feel and hear air being sucked in.

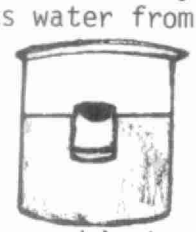
For older children you may wish to define air as many, many tiny particles called molecules that are too small for our eyes to see. Represent the air molecules with marbles.



2. We can show that air occupies space.

Equipment required: glass, kleenex tissue, tape, bucket of water.

Procedure and explanation: Tape a piece of kleenex tissue to the bottom of a glass. Lower the glass upside down into a bucket of water until the glass is completely submersed. Carefully bring the glass back up. The tissue remains dry becuase the air occupying the space in the glass prevents water from entering.

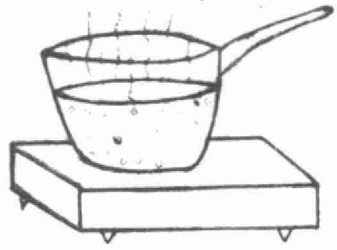


3. Air occupies space in many objects.

Equipment required: glass jar of water, piece of brick, pot, hot plate.

Procedure and explanation: Gently lower a piece of brick into a jar of water and notice the bubbles that rise to the surface, showing there are many air spaces in brick.

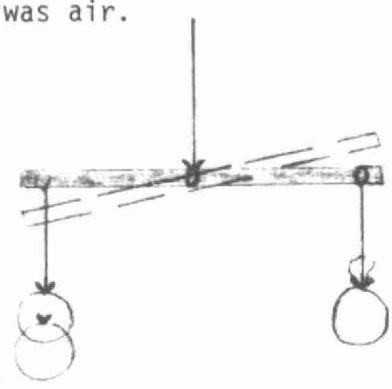
This can also be shown by slowly heating a pot of water. The air bubbles forming on the sides of the pot arise from the water.



4. Air has weight.

Equipment required: 2 balloons, 1 meter stick, string, sharp object.

Procedure and explanation: Blow up the 2 balloons so they are the same size. Tie them to a suspended meter stick, one at each end so they are balanced. Burst one of the balloons. The full balloon and the burst balloon weighed the same, something in the burst balloon must have been lost. This something was air.



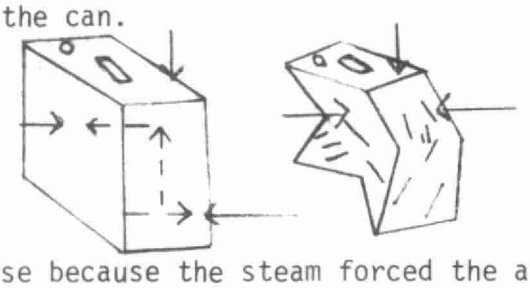
5. Air exerts a pressure.

We do not feel this pressure on the outside of our bodies since the air in the spaces inside our body exerts the same pressure outwards! We can demonstrate air pressure by removing the pressure outwards as shown in the activities, collapsing Can and Egg in the Bottle.

Activity: Collapsing Can

Equipment required: Water, ice cubes, gallon tin can, measuring cup, hot plate.

Procedure and explanation: Put 1 cup of water in the tin can, then place the can on a hot plate to bring the water to a boil. When steam rises, cap the can, then remove it from the hot plate. Rub ice cubes along the sides of the can.



The can will collapse because the steam forced the air molecules out of the can, then the steam was converted to water by rubbing the ice on the can so neither air nor steam was inside. Air molecules continued to bump in to the outside of the can, pushing in its sides. Therefore, we can see air exerts pressure.

Activity: Egg in the bottle

Equipment required: glass milk bottle, small hard-boiled egg (shell removed), pieces of crumpled paper, matches.

Procedure and explanation: Ignite the crumpled paper and drop it into the bottle. When the paper has almost completely burned, place the egg on top of the bottle, sealing the opening. The egg will be sucked into the bottle.

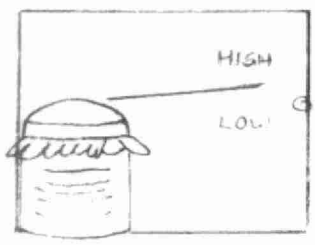
The air molecules inside the bottle were used up by the burning paper, reducing the pressure they exerted on the bottom of the egg. Consequently the air pressure outside pushing on the top of the egg was greater than the air pressure inside pushing on the bottom, forcing the egg into the bottle.

Changes in air pressure can be measured with a barometer.

Activity: Making a barometer

Equipment required: tin can, broom straw or soda pop straw, rubber band, a piece of saran wrap large enough to cover the top of the can, a piece of white paper, a paper clip, tape.

Procedure and explanation: Place the saran wrap over the top of the can, securing it with a rubber band. Wrap the piece of paper around the can so part of it is higher than the top of the can and tape it in place. Tape the straw to the centre of the saran wrap and mark its position on the paper with a paper clip. Mark HIGH and LOW, above and below the paper clip, respectively.



Watch for any changes in the straw's position. When the straw moves toward the HIGH the air pressure has increased, indicating the weather will be fair. If the straw moves toward the LOW, a storm is coming.

HEAT: Temperature is an indication of the amount of heat in the air. Heat affects air movement. As air is warmed it rises and as it cools it falls. Heat (temperature) also affects the amount of moisture in the air and the form (rain, snow, hail, sleet) that the moisture takes. Temperature will be discussed further in the sections "wind" and "moisture".

Children can construct a thermometer to measure temperature.

Activity: Making a thermometer

Equipment required: red food coloring, water, glass tube and stoppered bottle, piece of cardboard.

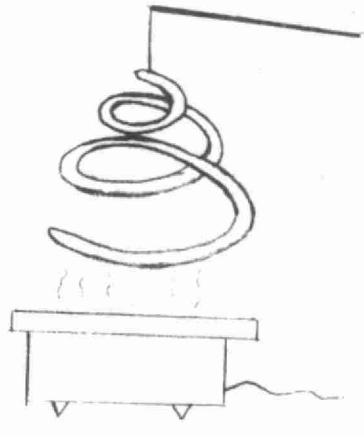
Procedure: Insert the glass tube through the hole in the stopper on the bottle. Mark the bottle where the glass stopper ends, then fill the bottle with red colored water to 2.5 - 3.0 cm above the mark. Calibrate the thermometer by comparing it to another thermometer and place the readings on the cardboard attached to the bottle.

WIND: Wind is moving air caused by differences in air pressure and temperature. The simplest example is the daily reversal in wind direction felt on the seaside. On a summer day the air over the land is warmer than over the ocean, causing a breeze to blow in toward shore; but at night the air is warmer over the ocean so the wind reverses direction. Wind formation can be demonstrated to campers.

Activity: Making a wind

Equipment required: stick, string, paper, scissors, hot plate.

Procedure and explanation: Cut a spiral ring out of the paper, then suspend it over a hot plate using the stick and string. The paper will spiral as the warm air above the hot plate rises, producing an up-drift. Cold air from the sides will move into the area of the hot plate.

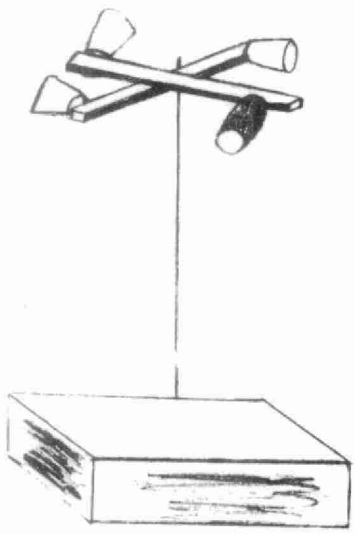


The children can build an anemometer to measure the wind velocity.

Activity: Build an anemometer

Equipment required: 4 paper cups, a drill, some brads, a medicine dropper, a coat hanger, 2 strips of wood, a block of wood.

Procedure and explanation: Bend the coat hanger into an 'L' shape and attach the short part of the 'L' to the block of wood with brads. Put the 2 strips of wood together to form a '+' then nail together. Drill a hole through the center of the '+' and run the medicine dropper through the hole. Place the wide end of the medicine dropper overtop of the wire hanger then seal the opposite end of the dropper by heating it. Fasten the cups to the wood strips after painting one of the cups. The cups will turn freely in the wind.



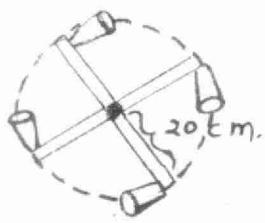
To calculate the wind speed (cm/minute) count the number of times the painted cup went around in one (1) minute. To calculate the distance the cup travelled in 1 turn around, measure the distance in centimeters (cm) from the hole in the '+' sign to the center of the cup and multiply that value by 6.28. To calculate the total distance the cup travelled in one (1) minute (i.e.: wind speed), multiply the number of times the cup went around in one minute by the distance of once around.

Example: In 1 minute, Sally saw the painted cup pass by 10 times.

The distance the painted cup travelled once around was: 6.28 x 20 cm = 125.6 cm.

The wind speed was: 10 times around/minute X 125.6 cm/once around

= 1256 cm/minute

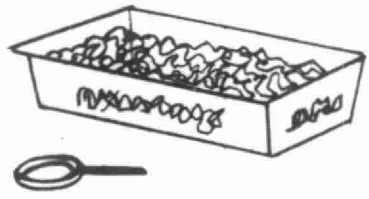


MOISTURE: Moisture in the air condenses as air is cooled to form precipitation. The form that the precipitation takes in falling to the ground (rain, snow, sleet, hail or dew) depends on the temperature.

Activity: Making snow

Equipment required: ice, salt, aluminum bread-loaf pan, something to crush ice, hand lens.

Procedure and explanation: Crush the ice, then alternate layers of ice and salt in the aluminum pan. Let it stand for a while, then observe the ice crystals forming on the outside of the pan with a hand lens. The crystals form as a result of the air in contact with the aluminum pan being cooled so the moisture in the air condenses and takes the form of ice since it is so cold.



The campers could construct a rain gauge to measure the amount of rainfall.

Activity: Making a rain gauge

Equipment required: gallon pain can, ruler.

Procedure: Place the gallon paint can outdoors before a rainfall. Let the water collect in the can, then measure water depth with the ruler.

Follow-up activities: With the weather instruments the campers can organize their own weather monitoring stations. An interesting comparison of the differences in weather between a field and forest may be undertaken.

Suggested books:

KEEN, M.L. 1975. The How & Why Wonder Book of Science Experiments Grosset & Dunlop Publishers, N.Y.

LEE, A. 1977. Weather Wisdom, Doubleday & Co., Inc., Garden City, N.Y.

INSECT STUDY

Introduction: The close examination of insects is becoming more and more popular with children today and it is no wonder, since insects with their small, delicate sizes, bright colors and fascinating habits do make interesting study projects. Every child will have had some experience with insects as they are the most numerous creatures to be found anywhere. There are over 650,000 species.

This study aims to develop a better understanding and appreciation of insects by examining the diversity in the appearance of insects and relating their appearance to their habitat.

This activity is suitable for campers 9 years of age and older.

Time Allotment: 1 - 1½ hours

Equipment required:

- insect collecting net - 1 per group*
- trowel - 1 per group for digging up insects
- glass bottles (variety of sizes) for holding insects
- magnifying glasses - 1 per group for examining smaller insects and insect structure
- white bedsheets to be spread under trees and bushes to collect insects shaken off the plants
- large drawing of an insect - see Appendix I
- large drawing of insect life cycles - see Appendix II
- Insect Study Chart - 1 per camper - see Appendix III
- Counsellor's Group Insect Study Chart - see Appendix IV
- clipboards and pencils - 1 per camper

* Instructions for building the collecting net are in Appendix V.

Procedure:

The study should begin with the question "what is an insect?" The counsellor should have a drawing of an insect prepared (see Appendix I). As the children describe the characteristics of insects, they should be labelled on the drawing. The characteristics should include:

(i) 6 legs
(ii) 3 body parts - head, thorax, abdomen
(iii) 2 pairs of wings
(iv) Exoskeleton
(v) Compound eyes
(vi) Antennae

Sometimes all of the characteristics of insects cannot be seen on an organism. This occurs if the organism has not reached maturity or the adult stage in its life cycle. There are 2 basic life cycles for insects (see Appendix II). Life cycle charts should be drawn for the children to see.

The land life cycle starts with the egg which develops into a larvae. At this time, the insect is described as being in the larval stage. In mid-summer, the larvae builds a casing around itself. The construction of the casing initiates a new stage in the life cycle called the pupal stage. Inside the casing, the pupa undergoes a final transformation into the adult form. The adult, bearing all the features of an insect, emerges from the casing in spring.

The water life cycle also begins with the egg. The egg hatches as a nymph. Both of these stages occur in the water. At the end of the nymph stage, the nymph will emerge from the water and transform into an adult.

Since the various stages of insect life cycles occur both in water and on land, insects can be found anywhere. Ask the children where they would search for insects. Their responses should include: under rocks, on trees, in and on the ground, in the air, etc.

Divide the campers into groups, each group being assigned to a specific habitat (e.g. under rocks) to collect insects. Equipment should be distributed according to the habitat where the groups will be collecting.

Groups collecting insects from the ground or in the air should use the collecting nets. Sweep the net through the grass or air. Once an insect has been captured, quickly close off the end of the net by tightly grasping the opening. Try to manipulate the collecting dish into the net without letting the insect escape. Once the insect has been trapped in the dish, quickly slip on the lid of the jar.

To collect crawling insects, the jar must be placed over the insect. Then, gently slide the lid under the insect, trapping it within. For the more courageous campers, using hands is adequate. However, do warn the campers to be gentle.

To collect insects on trees or shrubs, lay a bedsheet under the tree or shrub. Shake the plant so the insects fall onto the bedsheet. Place the insects picked off the vegetation into collecting jars.

After the campers have finished collecting, each group should carefully examine the insects they collected and complete an Insect Study Chart.

After each group has finished studying the insects their group collected, a comparison can be made of the insects collected by the other groups (see Appendix IV). Ideas may arise on ways insects are ADAPTED to live in different habitats. These adaptations include: flight, locomotion, coloration, size and mouth parts. For example, the group sampling flying insects may find the wings of their insects larger and more obvious than the insects collected by a group from under rocks.

Note: After the study, all insects should be returned to their original sites unharmed.

Follow-Up Activities

Younger children:

(i) Make an insect out of popsicle sticks. A story can be written about the insect -- where it grew up, what it eats, etc.

(ii) A hunt to discover evidence of insect activity may disclose the eggs from the spittle bug; galls on goldenrod; coccoons in tree bark; insect homes like wasps' nests; ant hills; etc.

(iii) Discuss the ways in which insects are good; are bad; Thought should be given to their importance in pollination; in producing food, such as honey; in being food for other animals and plants; in controlling weed growth (e.g. the alligator weed beetle) and in controlling other insects (dragonflies eating mosquitoes). Insects may also be harmful by destroying crops, spreading disease and acting as nuisance pests like the mosquito or blackfly.

Older children:

(i) can study the values and vices of the use of insecticides and pesticides. A trip may be planned to a local orchard to find out which insecticide they use, how it is applied, how frequently it is applied.

(ii) A night insect study would reveal the nocturnal insects and how they are adapted to their habitat.

Night Insect Study *

a) Light will attract insects: Using extension cords, place a light bulb outside, covered with a white sheet. After an hour, take a look at the creatures that have landed on the sheet. Try changing the color of the light bulb to red, blue or yellow. Which lights are attractive to night life? which are not?

b) Some insects make their own light: Just like we "talk" using neon lights, insects also "talk". Male fireflies "talk" to the females by flashing colors. Different species of fireflies use different codes of light flashes. Using a pen flashlight, have the campers try "talking" to a firefly.

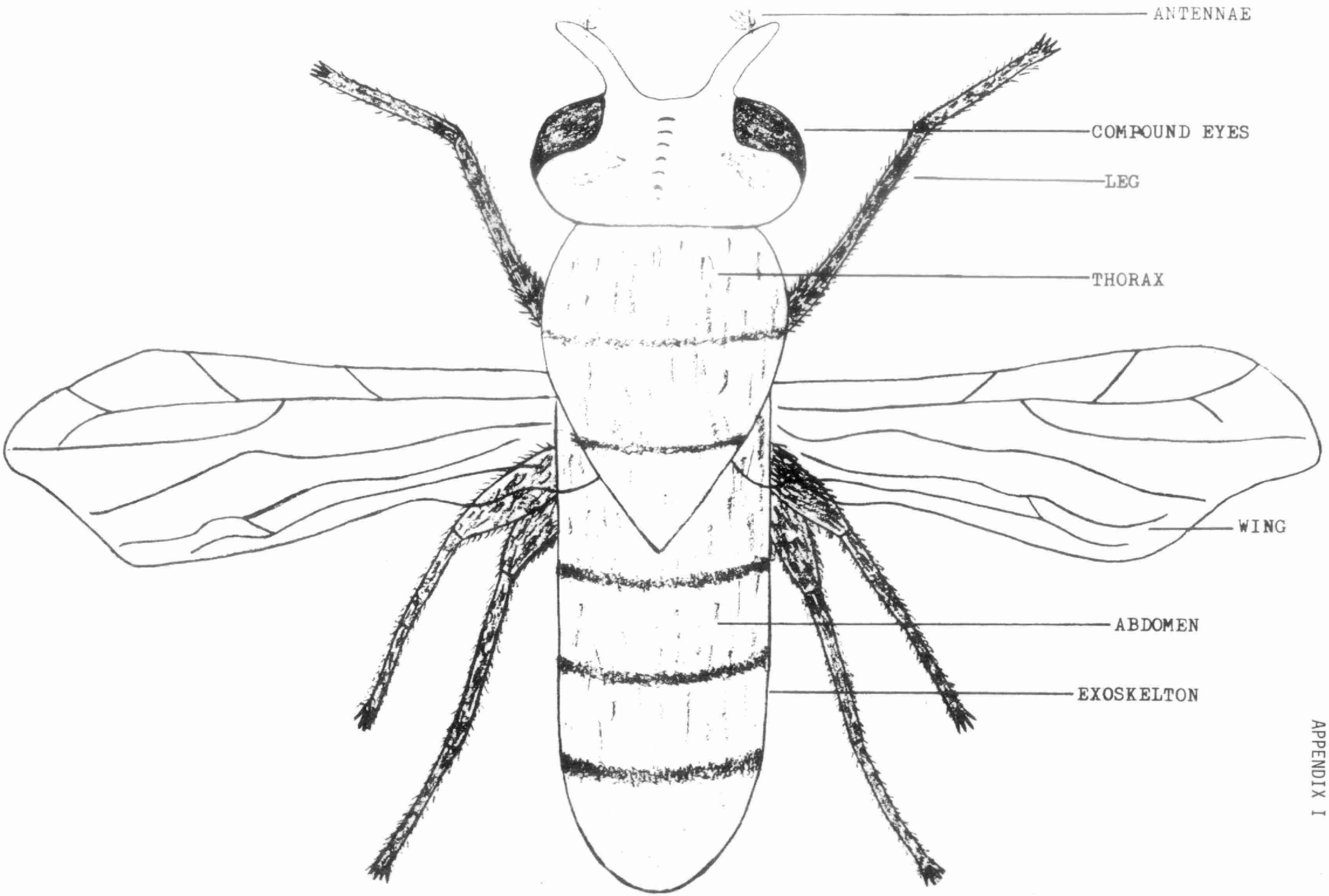
c) Smell will attract insects: Many flowers have very strong evening perfumes. Find some flowers producing a strong scent (e.g. honeysuckle, evening primrose). Ask the children to record what insects are visiting these particular flowers. A test can be conducted to determine which smells attract insects. Using cups, mix in each cup something with water that will give the water a certain smell (e.g. vinegar, honey, lemon juice, rubbing

* Adapted from ECO-NEWS Vol. 8, No. 7, May 1978. OUT IN THE BIG DARK.

alcohol, chopped raw meat). After half an hour record which cup had the most visitors.

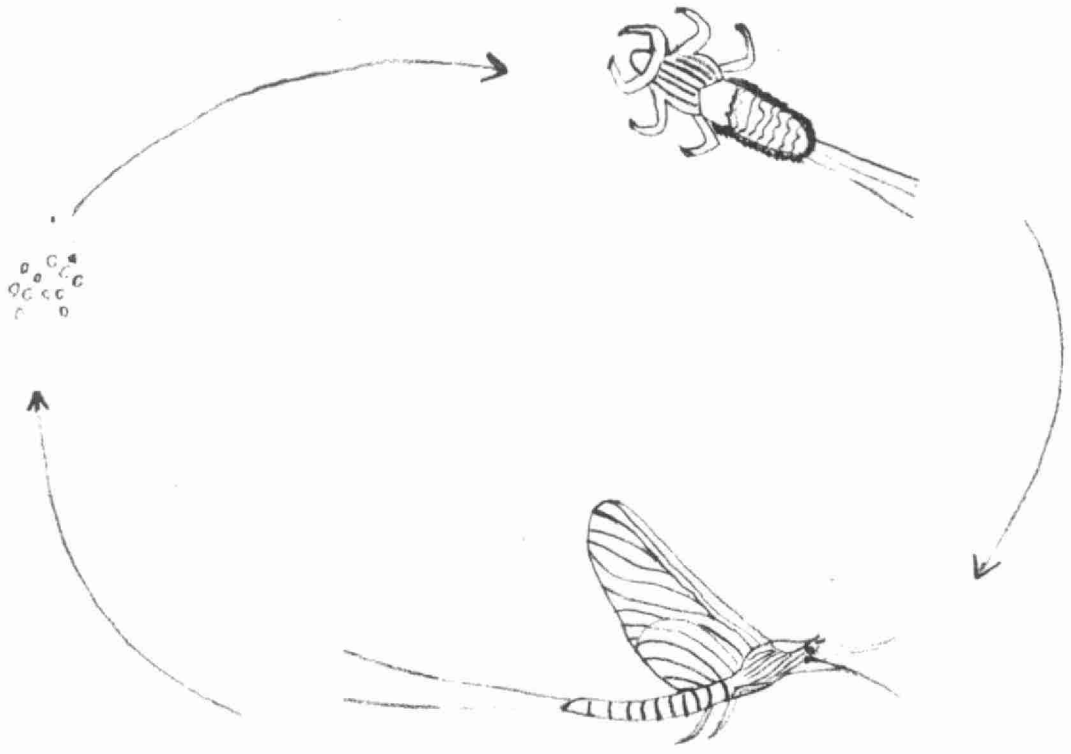
References:

INSECTS - Golden Nature Guide Series,
Golden Press, New York.

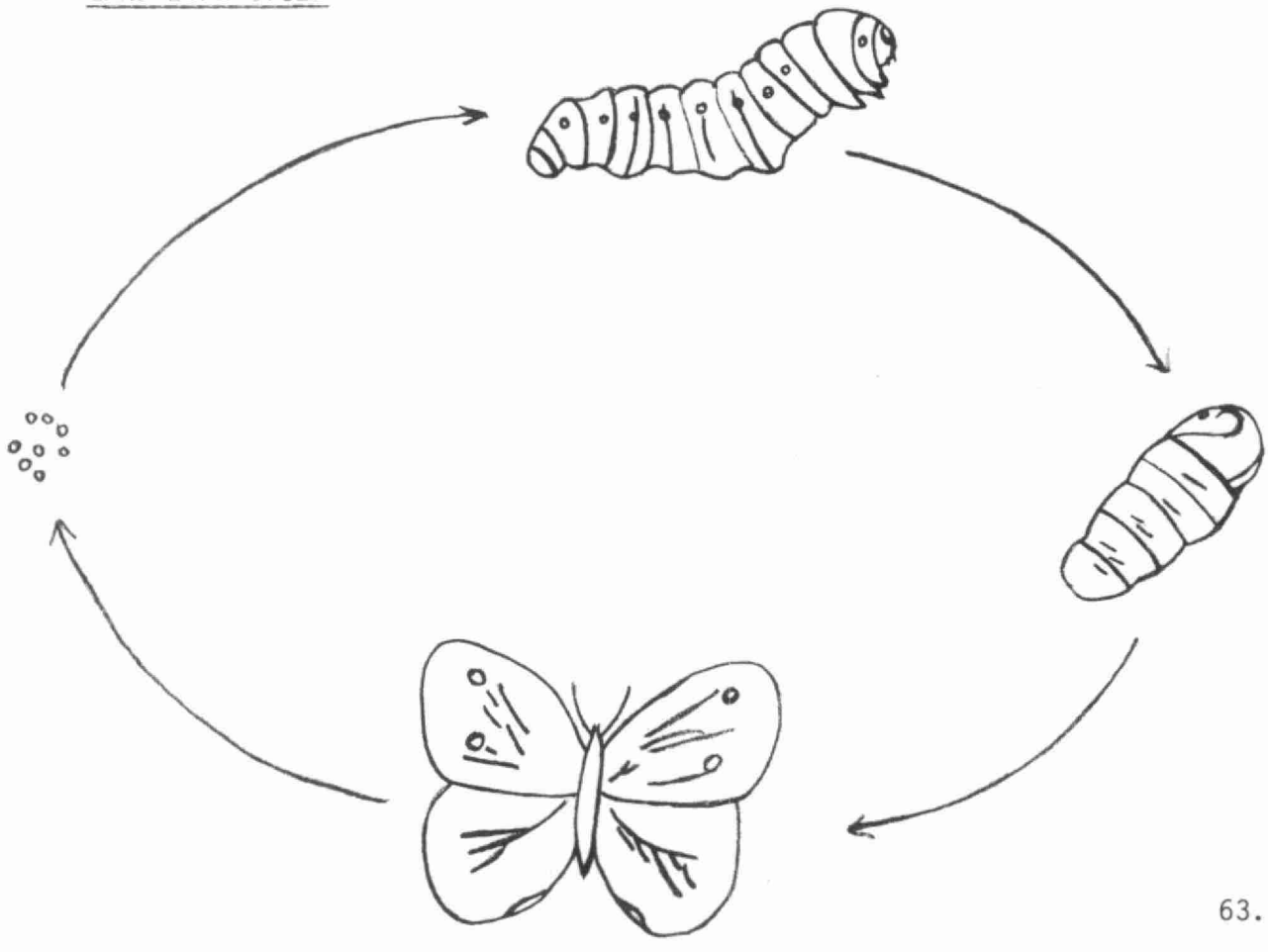

ANTENNAE
COMPOUND EYES
LEG
THORAX
WING
ABDOMEN
EXOSKELTON

INSECT LIFE CYCLES

WATER LIFE CYCLE



LAND LIFE CYCLE



APPENDIX III

INSECT STUDY

INSECT (Name/picture)	WHERE FOUND	COLOR	SIZE	SHAPE*	TYPE OF LEGS **	DESCRIBE WINGS	TYPE OF MOUTH PARTS	ADAPTATION TO ENVIRONMENT
	in tall grass	green & brown	big	slender & flat	grabbing	long, thin & green	chewing	has wings for flying has big eyes for seeing

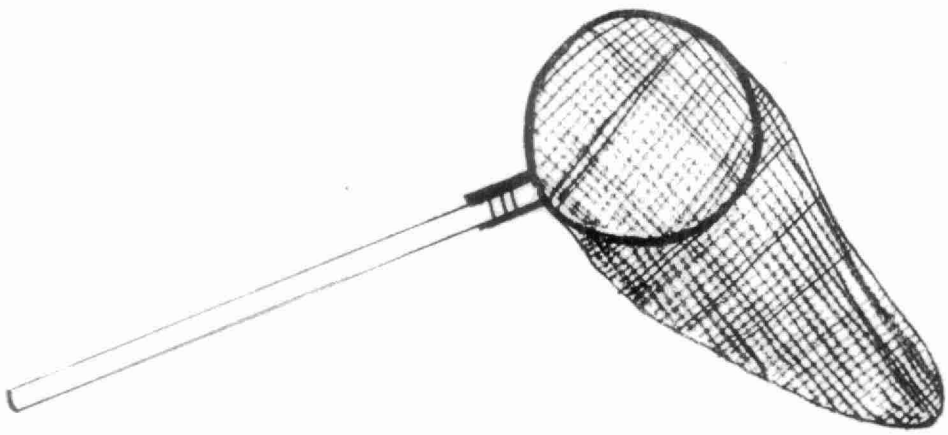
ADJECTIVES FOR:
* SHAPE: round, oval, rectangular, flat, slender, square, triangular.
** LEG TYPES: running, jumping, grabbing, digging, swimming.
*** MOUTH PARTS: chewing, sucking, piercing, lapping.
SIZE: either cm, or big, small.

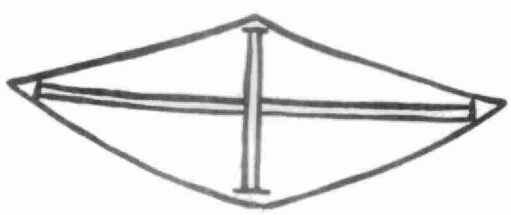
INSECT STUDY CHART

HABITAT	ORGANISMS	ADAPTATION TO THEIR HABITAT

EQUIPMENT BUILDING FOR INSECT STUDY

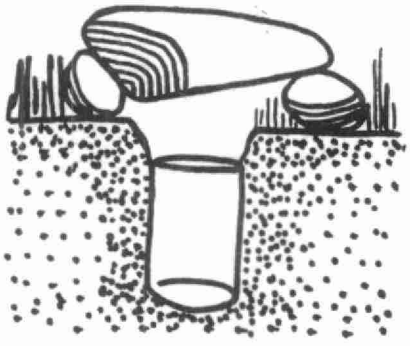
1. A COLLECTING NETS: are used for collecting insects from the air and on vegetation. Bend a coat hanger into a ring about 30 c.m. in diameter. Make a net bag from nylon stockings, cheesecloth or netting of a 3 m.m. mesh, about 50 c.m. in depth. Sew the bag onto the ring. The ring and net bag can be attached to a long pole of up to 75 c.m. in length with tape. A broom handle or hockey stick is ideal.





B BEATING CLOTHS: Using material similar to the above (and using diagram as a guide) a beating cloth can be improvised. The beating cloth is used to catch insects as they fall out of trees and bushes which are gently knocked or shaken. An old sheet may be held under the tree by several campers while another shakes the branches. A beating cloth may be made by attaching pieces of wood, sticks or hanger wires to a piece of cotton that is about 1 m square in size.

2. In-ground traps:



- cans, soft drink or soup cans with the top removed may be used.
- sugar, honey, jam, or similar sweet bait.
- rotting meat or a piece of fruit or similar solid bait.

Sink a tin can or similar container into the ground, placing either the sweet or solid bait inside. Cover the can with a rock or a piece of wood allowing some air space to protect any captured specimen from the rain. Crawling insects such as beetles will be lured into the can.

3. Insect container:

- container, a 2.28 litre milk carton with the top cut off is ideal.
- mesh, wire screen.
- string, 1 m in length.

Attach the string to the container to form a carrying handle. The screen can be held over the top with elastic bands. Glass jars may also be used but are not recommended because of the possibility of breakage.

4. Field notebook: - paper attached to a board or heavy cardboard with a pencil attached.

5. Magnifying lenses: (optional)

A suitable location for an insect study is an open field of long grass and shrubs with a nearby woodlot. Begin this hour-long activity by demonstrating how to set up the in-ground traps, how to sweep the net back and forth through long grass, weeds, and shrubbery and how to hold the beating cloth under the trees and how to gently knock, shake, and beat the branches.

Groups of two or three students working together can then use these techniques to collect insects. The insects are then placed in the specimen container, observed, identified, and recorded in the field notebooks. If the campers cannot identify something they have caught, a carefully drawn picture is advantageous. The in-ground traps are checked at the end of the session.

The group leader should rotate between the campers to help them identify specimens, to offer advice on collecting techniques, and to encourage careful observations through the use of questions as outlined below.

If time permits, centipedes, millipedes, sowbugs, pillbugs, and some beetles may be discovered by looking in damp, dark places such as under large rocks, old boards and pieces of wood, and under leaves. An ant colony may be studied by watching the ants' behaviour when bread or cookie crumbs are sprinkled nearby. Spiders may be found in shrubs, in the cracks of tree trunks, in the ground, or in dark places. How many different kinds of spider webs can be found? A spider may be hiding near its' web under a leaf or branch so look carefully. In a woodlot the children can examine a 30 cm square of ground under the trees, quietly searching for the tiny insects that make their homes there.

Look for insect signs such as damaged or diseased plants, sticky substances on plants and insect homes such as galls, cocoons, mud nests, winding tunnels in rotting wood, in the ground, and also on leaves.

As often happens in outdoor activities, students are full of energy, boisterous, and noisy. Stress quietness. The sound of our voices is as loud as thunder booming in the sky during a rainstorm for nearby insects. Let's not scare them away.

QUESTION GUIDELINE

Flies: How many wings do you see? What color are they? How many legs does it have? Can you see its' eyes? What color are they? What kind of noise is it making? Can you see its' mouth?

Ladybird Beetles: Can it fly? How many spots does it have? Does it have the same number of spots as another one? How long are its' legs? Where did you find it? What kind of plant was it on?

Butterflies: Are its' wings smooth and shiny or fuzzy and rough? Where are its' legs? How long is its' body? How wide are the wings?

Leafhoppers: Are all its' legs the same length? Why is this? How many different colors can you see on its' body? What shape is its' head? How far can it jump?

Carpenter Ants: How does it hold food and move at the same time? How many parts or divisions is the body composed of? Does it have feet? How long are the antennae? Does it have wings? Why not?

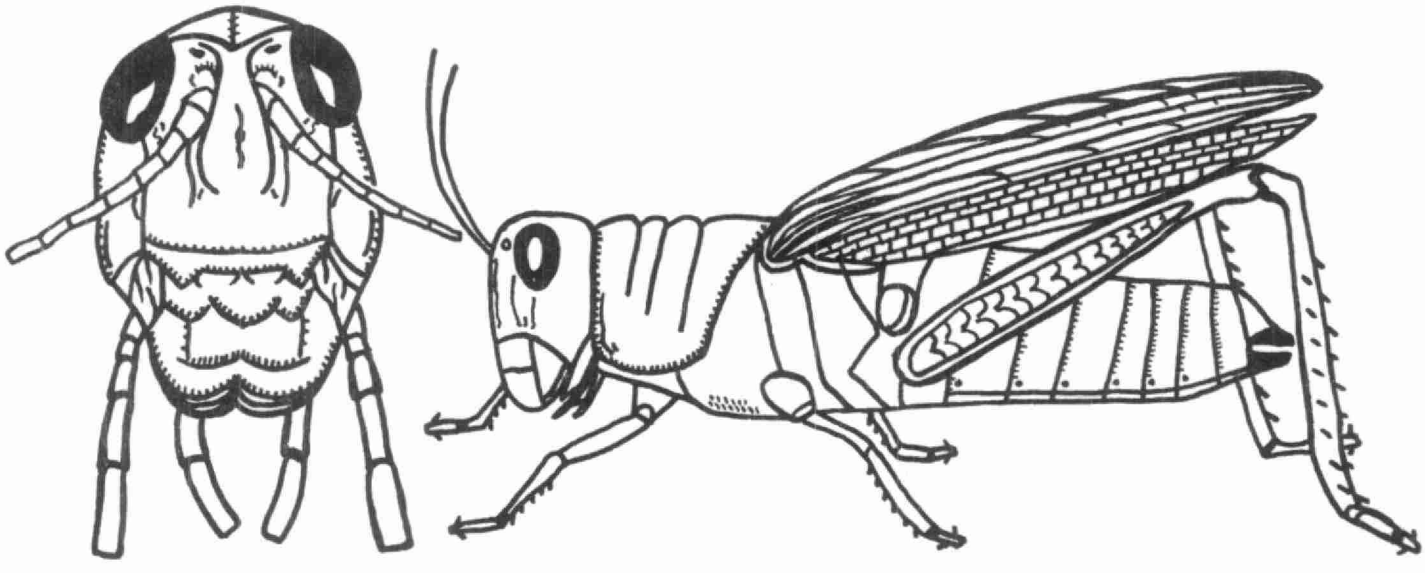
ADDITIONAL ACTIVITIES

1. Follow a crawling insect along the ground. What does it eat? Where is its home? How fast did it move?

2. Have a grasshopper race. Be careful when holding the insect in your hands. It does not enjoy being squeezed too hard.

3. Build a maze and put an ant in it. How long did it take to find the food? Try it several times. Did it take less time the second or third time?

Identification



AQUATIC INSECTS

1. May Flies (Ephemerotera)

May flies are abundant in streams and lakes and can be found in practically all fresh water throughout the Province. The nymphs are found on the undersides of rocks or other underwater objects. They have two or three tails. The wings of the adult are held in an upright position while resting.

2. Dragonfly (Odonata)

They are found in all types of fresh-water areas; ponds, lakes, streams, and swampy areas. The nymphs can be found crawling about on the bottom, on aquatic plants, or other underwater objects. They are one of the largest aquatic insects; most of them are dark brown to greenish as juveniles, change to brighter colors as adults. When resting, their four wings are held outstretched.

3. Stone Fly (Plecoptera)

Stone flies seem to require running water in which to live. They are never found in lakes except in the inlets and outlets. When the adult is resting its wings lie lengthwise upon the back. Nymphs are found in abundance only among the rocks in streams. Stone fly nymphs have two long and stiff tails.

4. Water Boatman (Hemiptera)

Boatmen are found in nearly all waters. They swim in an erratic pattern underwater, and usually found in slow moving waters. Boatmen are normally brownish in color and equipped with leathery wings.

5. Water Strider (Hemiptera)

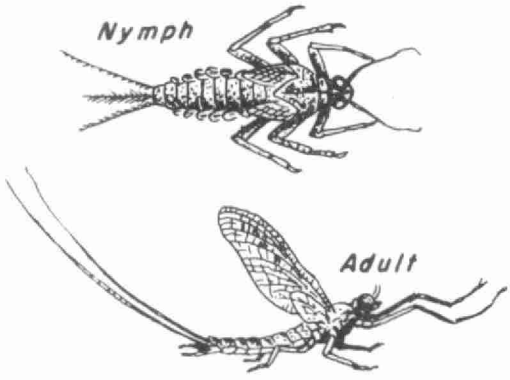
Water striders are a familiar sight on the surface of slow moving waters, ponds, and lakes. They resemble long legged spiders. Although equipped with wings, they are rarely observed in flight. Their color is usually brown to gray. Many persons call them "water skippers".

6. Caddis Fly (Trichoptera)

Caddis flies are found in nearly all lakes, streams, and ponds. During their underwater life, they live in cases made from sticks and small particles of rock. These can usually be seen moving about on the bottom. When the adults are at rest the wings are held roof-like over the body and sloping down at the sides. The adults are generally dull brown or black in color. Sometimes the larvae are called "penny winkles" by fishermen. "Periwinkle" is another common name.

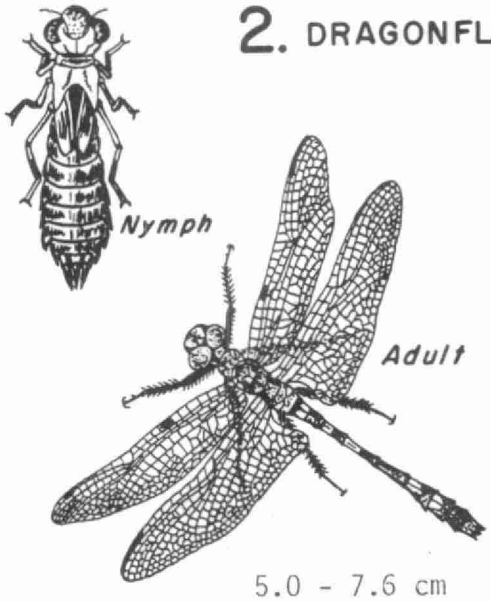
AQUATIC INSECTS

(REPRINTED WITH PERMISSION OF OREGON DEPARTMENT OF FISH AND WILDLIFE)



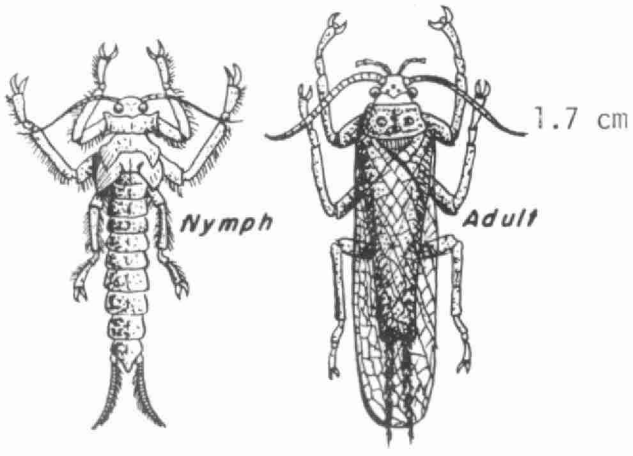
2.8 cm

1. MAYFLY



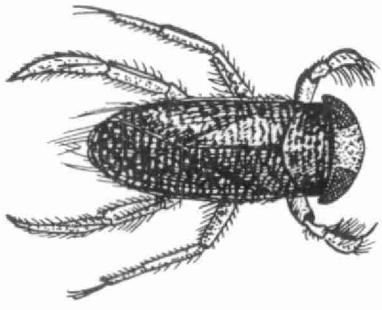
5.0 - 7.6 cm

2. DRAGONFLY



1.7 cm

3. STONEFLY

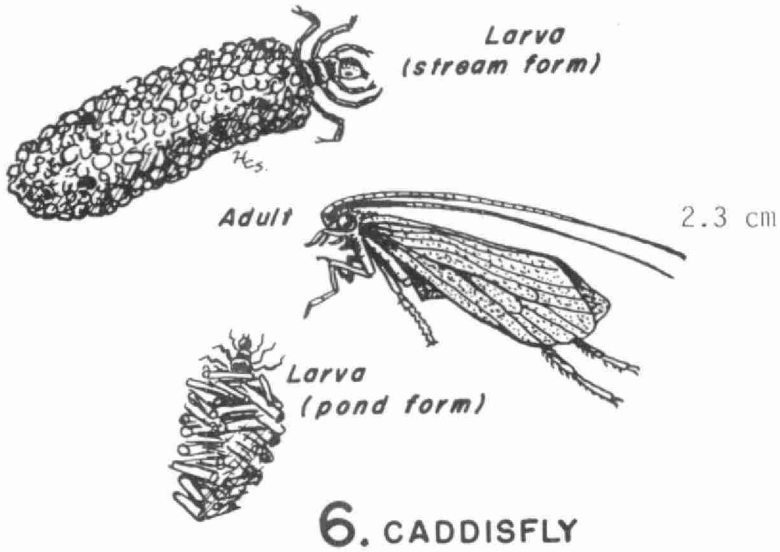


1.0 cm

4. WATER BOATMAN

1.0 cm

5. WATER STRIDER



2.3 cm

6. CADDISFLY

7. Whirligig Beetle (Coleoptera)

These are found on the surface of slow moving waters, taking advantage of the surface tension. The Whirligig beetles, true to their name, whirl or swim on the water's surface. When disturbed they dive under the water, frequently. Their bodies are dark colored, robust, and the front legs are long and slender.

8. Crane Fly (Diptera)

The larvae of the Crane fly are found in scum of shallow waters, in the damp soil along streams or lake shores, and marshy areas. The adults are never truly aquatic and may be found great distances from water. The adults look much like giant mosquitoes without a beak.

9. Mosquitoes (Diptera)

Mosquitoe larvae are usually found in stagnant slow moving water. Most people are familiar with the appearance of adults and know that they are more abundant around marshy, damp areas. The young are often called "wigglers" and can usually be found wiggling about just under the water's surface. Contrary to popular belief, not all mosquitoes bite, the males just buzz and are not equipped for biting.

10. Black Fly (Diptera)

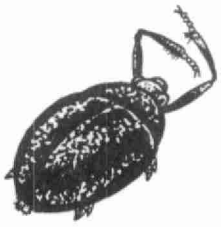
The larvae are found in flowing water (only) on stones, vegetation, or other objects, usually in the swiftest part of the stream. In many cases, the larvae are so numerous they appear moss-like over the surface of the attached object. Later on in life, they live in a cocoon which is customarily a boot-shaped structure. The Black fly as the name implies, are usually dark compactly built flies, with rounded black and short broad wings. The adults may be found great distances from water.

11. Midges (Diptera)

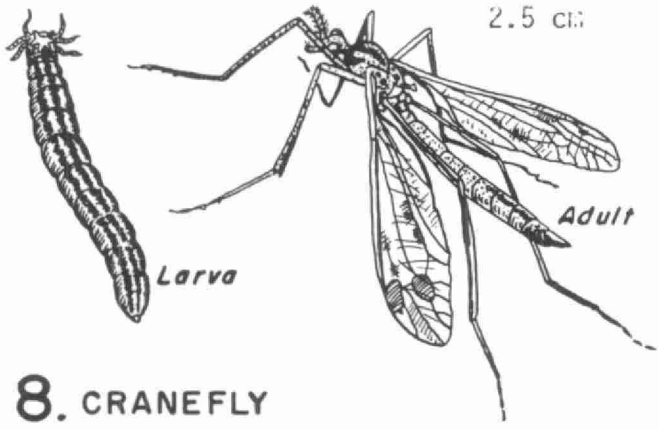
Larvae are most abundant in the shallow water areas of lakes, ponds, and streams favored by a heavy growth of aquatic plants. They prefer soft mucky bottoms, as they are a bottom-dwelling species, and need this type environment for constructing their tube-like homes. Larvae live in soft tubes, however, during later stages of life they are found living in silken cocoons or gelatinous cases. The adult Midges look much the same as mosquitoes. Their antennaes look like two feathers on the front of their head and they don't have a beak.

AQUATIC INSECTS

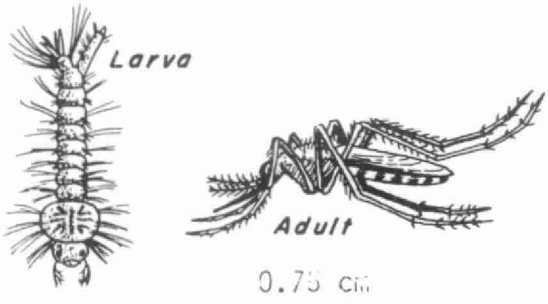
(REPRINTED WITH PERMISSION OF OREGON DEPARTMENT OF FISH AND WILDLIFE)



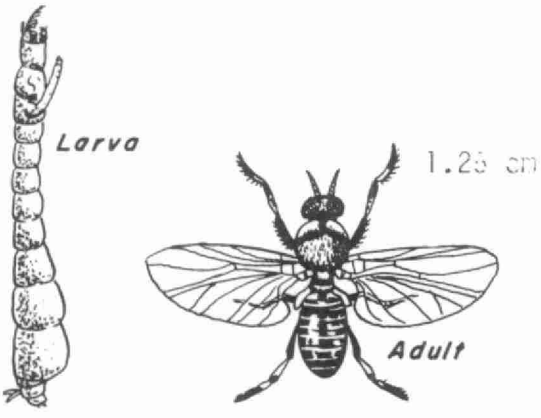
7. WHIRLIGIG BEETLE



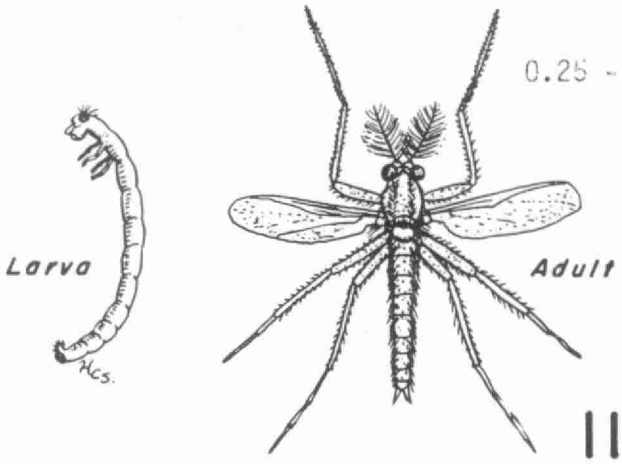
8. CRANEFLY



9. MOSQUITO



10. BLACK FLY



11. MIDGE

SURFACE FRESH-WATER ORGANISMS

1. Planaria (Turbellaria)

Planarians are fairly common in ponds, lakes, springs, and other fresh waters among vegetation, beneath stones, or crawling over the bottom. These free-living flatworms are usually arrow-shaped and vary in color from white to black depending on species and environment. Small planaria look much the same as the adult differing only in size.

2. Bryozoan Colony (Broyozoa)

Fresh-water Bryozoa are very common in lakes, ponds, and rivers. They are community dwellers, living in jelly type substance which is formed on sticks as a gelatinous ball or a mossy mat over the surface of underwater objects. There is a wide range in color, some colonies are brownish and still others have a greenish tinge. Colonies are made up of thousands of these tiny animals.

3. Leech (Hirudinea)

Leeches make homes in lakes, ponds, or other fresh-water areas. They can be seen moving about underwater by their well-known "Measuring Worm" type of travel, or swimming freely. Leeches are predatory or parasitic segmented worms with sucking discs which are used in attachment, movement, and feeding. They are usually dark brown to black in coloration.

4. Daphnia (Cladocera)

Daphnia are found in all sorts of fresh waters. The shallow, weedy backwaters of a lake whose water level is fairly permanent harbors greater numbers than any other kind of locality. These little crustaceans are virtually transparent, and are best recognized by their two-branched antennae, robust bodies, and sharp-tailed spine.

5. Cyclops (Copepoda)

These little fresh-water crustaceans are very familiar in all slow moving waters, especially shallow ponds. Their bodies, like the Daphnia, are very transparent and are characterized by the forked antenna and the branched tail. The female usually has two groups of eggs attached to her body just ahead of the tail.

6. Fairy Shrimps (Anostraca)

For the most part, fairy shrimps live in temporary pools and ponds of fresh water. They are frequently seen underwater, rowing themselves about on their backs, by means of numerous, similar, flattened appendages. These appendages are always faced toward the source of light.

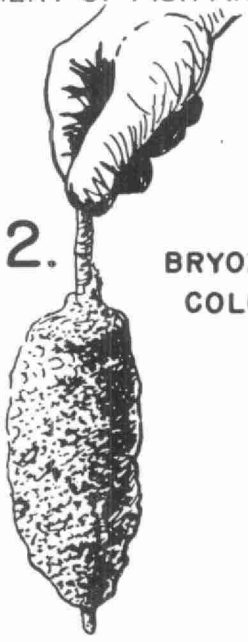
7. Fresh-Water Shrimp (Malacostraca)

These are found in lakes, streams, and ponds in eastern and western Oregon. Shrimp are usually found among the aquatic plants, rocks, and algae. Usually they are nearly transparent and look something like a "sow bug".

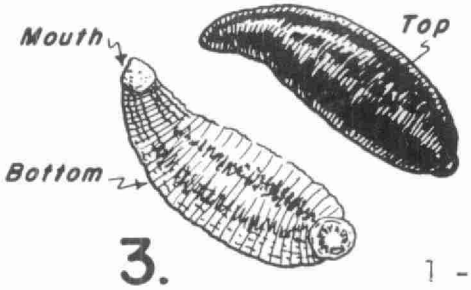
SUB-SURFACE
FRESH WATER ORGANISMS

(REPRINTED WITH PERMISSION OF OREGON DEPARTMENT OF FISH AND WILDLIFE)

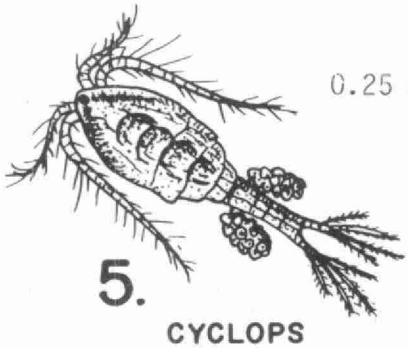
1. PLANARIA



2. BRYOZOAN COLONY



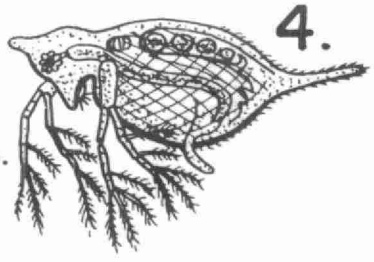
3. LEECH 1 - 5 cm



0.25 cm

5. CYCLOPS

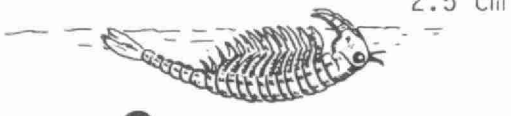
DAPHNIA



4.

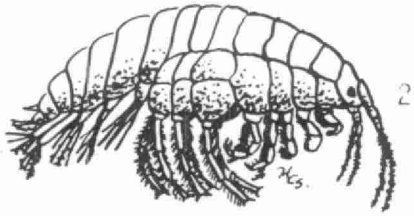
0.16 cm.

FAIRY SHRIMP



2.5 cm

6.



2.5 cm

7. FRESH WATER SHRIMP

BIRD IDENTIFICATION

When bird watching, you may find that the bird does not stay in sight long enough for you to find it in an identification book. To assist you, therefore, the following data sheet has been prepared. Using the preceeding three pages as a guide, fill in the form and then take the time to find the bird in a nature book.

DATA SHEET

SIZE A

SHAPE

General B

Bill Shape C

Tail Shape and Markings D

SIGHT

Main Color

Special Markings E

FEET F

SPECIAL HABITS

FLIGHT PATTERN

Description

Sketch

Name of Bird

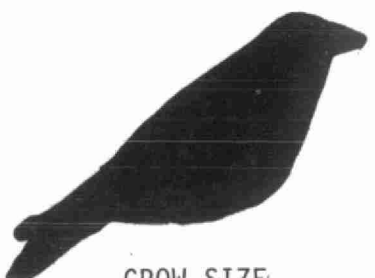
Site

Prepared by the staff of the Kingfisher Lake Outdoor Education Centre, Thunder Bay, Ontario.

A SIZE

SPARROW SIZE
5¼" TAIL TO BEAK
(13 cm)

ROBIN SIZE 8½"
(31 cm)



CROW SIZE
(43 cm)

Estimate the size of the bird you are observing -- is it smaller than a sparrow? Larger than a sparrow but smaller than a robin? Express approximate size in cm.

B GENERAL BODY SHAPE

chunky as a meadow lark

plump as a grouse

slender as a swallow

downright bulky as an owl

Does the shape of the bird that you are observing compare with any of the above? If not use words that you think describe the shape of the observed bird.

C BILL SHAPE

Bill of a nectar-eating bird.

The hooked bill of the hawk is used to tear away prey.

The chisel-tipped bill of the woodpecker is used to dig insects out of the wood.

The strainerlike bill of the duck is used to sieve food from the water.

The stout, heavy bill of the seed crackers.

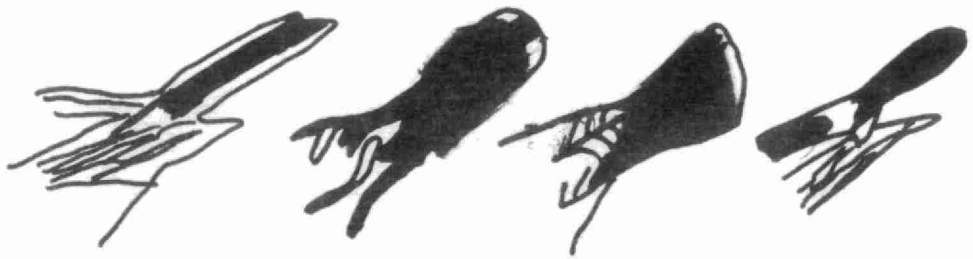
The spearlike bill of the heron is used to catch fish and frogs.

What kind of bill does the bird that you are observing have?

D TAIL SHAPE AND MARKINGS

Is the tail forked, squared or rounded? If not use other words to describe the tail.

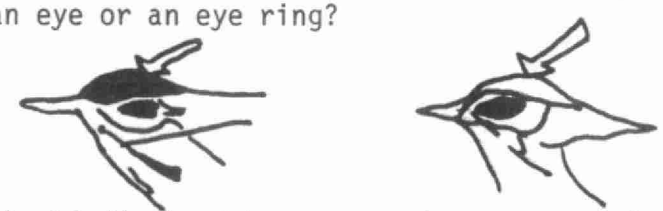
Does the tail have



outer white tail feathers, white tail tips, tail band or colored rump patch?

E SPECIAL MARKINGS

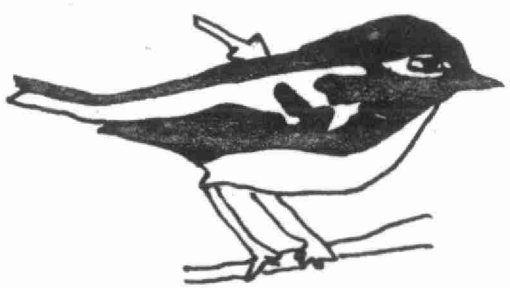
Special Markings. Characteristic markings help in observing birds. These are known as "field marks". Does the bird have an eye or an eye ring?



Does the bird's head have a crest, crown patch or crown stripes?

Is the breast striped, spotted or unmarked?

How many wing bones are there?



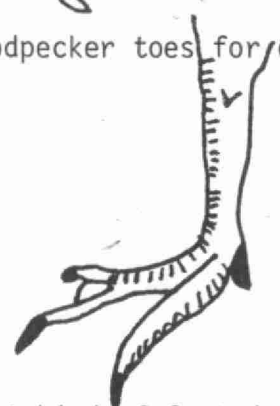
F FEET

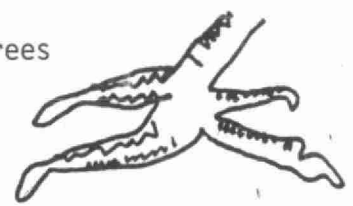
Curved claws of birds of prey.

Long legs of a wading bird

Feet of a perching bird

Woodpecker toes for climbing trees





Webbed foot of a duck

What kind of feet does the bird that you are observing have?

Games

QUIET GAMES

WHAT AM I?

A player leaves the room and the group decides what animal or other nature object he shall represent. The player returns and tries to discover what he represents by asking questions on characteristics that may be answered by "yes" or "no". When he identifies himself, the person whose answer helped him make the discovery leaves the room next.

Variation: Ask a player to think of an object and write it down on a slip of paper. The rest of the group may then ask him questions which can be answered "yes" or "no" until they find out what the object is.

Variation: Have a panel of four who ask questions. They may play as "20 questions" and ask only 20 questions, taking turns, or they may ask any number of questions.

Variation: Have a number of clues describing a nature object written on a card with the most difficult clue listed first and each clue becoming easier or more obvious. Read the clues one at a time until someone guesses what the object is. The player guessing correctly gets to keep the card. If an equal number of clues are used for all objects one might give scores by the number of clues it takes to guess the object.

* * * *

WHAT IS WRONG WITH THIS PICTURE?

Announce that a certain nature object is to be described and, although most of the characteristics given will be true, a few false ones will be included. See how many can detect the incorrect ones.

* * * *

NATURE CHARADES

Played like regular charades, either in teams or individually, by acting out the word. Some examples of nature categories:

Flowers:	carnation	car - nation
	sweetpea	sweet - pea
	dogwood	dog - wood
	marigold	Mary - gold
	lady slipper	lady - slip - her
	lady finger	lady - finger
	foxglove	fox - glove
	touch-me-not	touch - me - not
	primrose	prim - rows
	four-o'clock	four - oh - clock
	bettersweet	bit - her - sweet

NATURE CHARADES (cont'd)

Birds:	sparrow	spare - row
	thrasher	thrash - her
	towhee	tow - he
	warbler	war - blur
	woodpecker	wood - peck - her
	vireo	very - oh
	kingfisher	king - fisher
	killdeer	kill - deer
	pintail	pin - tail
	catbird	cat - bird
	grosbeak	gross - beak
Trees:	basswood	bass - wood
	hornbeam	horn - bean
	buckeye	buck - eye
	catalpa	cat - tall -pa
	sycamore	sick - ah - more
	walnut	wall - nut
	tulip tree	two -lip - tree
	tamarack	tam - ah -rack
	mulberry	mull - berry
	chestnut	chest - nut

Excerpts from "A Leader's Guide to Nature-Oriented Activities" by Betty Van der Smissen and Oswald H. Goering. The Iowa State University Press, 1977. Price $6.95.

seek and solve

T	H	E	T	R	A	S	H	R	E	S	L	E
B	I	R	T	T	E	E	R	L	A	L	S	L
U	I	L	O	V	A	E	A	A	R	I	A	E
D	N	D	S	T	M	R	O	W	O	G	I	C
N	T	H	R	E	U	A	L	N	I	R	I	T
T	W	E	I	T	L	I	I	L	G	E	T	R
E	E	V	A	D	T	E	O	N	W	O	R	I
S	U	N	U	T	E	S	S	D	U	O	L	C
E	I	M	E	F	W	E	E	D	O	N	T	S
T	P	R	E	U	S	E	W	A	R	T	T	O
C	A	O	R	E	W	E	A	O	M	U	S	T
R	E	C	L	Y	C	L	E	R	L	O	U	R
R	E	W	O	L	F	A	E	L	S	L	G	A
R	I	B	A	E	U	G	E	L	A	T	E	N
M	D	V	A	L	C	T	L	E	E	A	E	Y
R	A	R	E	O	N	U	E	M	G	R	I	M
A	T	N	P	R	O	U	G	S	A	R	G	E
H	R	O	M	U	N	D	O	R	B	S	A	T
N	D	R	E	A	P	L	M	A	E	C	E	A
U	N	N	E	E	D	D	S	E	G	E	D	L
L	S	E	D	O	R	E	N	E	A	O	N	S
U	P	D	N	O	E	I	I	S	B	E	S	W
W	I	I	T	D	U	S	T	H	R	O	Q	E
U	L	I	E	T	E	R	S	O	A	U	R	E
N	L	I	T	T	E	R	B	U	G	D	S	P

Directions:

This puzzle is called a chain reaction. The words to find are listed below. Notice that the first letter of every word is the same as the last letter of the word before it. Find the first word and then the following words will connect to each other. Put a line through the letters as you find the words. The letters that are left over form a poem below. Take the spare letters in the exact order they are written and fill them in the blanks. When the poem is completed, all the letters will be crossed out.

BUD	LAWN	EARS	SMELL	MANMADE	SWEEP
DIRT	NOISE	STEM	LEAF	ERODES	PROBES
TRASH	ELECTRIC	MY	FLOWER	SPILL	SEED
HEAT	CLOUDS	YELLOW	RIVER	LITTERBUG	DUST
TREES	SOIL	WEED	ROLE	GARBAGE BAG	TINS
SUN	LITTER	DUMP	EARTH	GRIM	SMOG
NATURAL	REUSE	POLLUTES	HARM	METALS	GREEN

_____ _____ ___ ____ ___ ____ __ ___ ___,

__ ____ ___ ____ _____ __ __ ____ _____ __ ____.

__ ____ _____ ___ _____ ___ _____ __ ___ _____,

___ _____ _____ ____ _____ ____ _____ _____.

SURVIVAL GAME

PURPOSE: To increase Awareness and Appreciation of Wildlife.

OBJECT: To Take on the Role of a Specific Animal and Survive.

NO. OF PARTICIPANTS: 15-40 (or more)

AREA AND EQUIPMENT:

OUTDOORS
- two to three acres of field, bush, and stream
- definite boundaries which outline this area should be defined

LIFE CARDS:
- cardboard or bristol board 1" by 2" approx. with animal names printed on them
- OR - formica samples (they last longer)
- eight required per herbivore
- deer - four, fox - three, wolf - two

SHOWER RINGS:
- to hold life cards

ORIENTEERING PUNCHES: or MAGIC MARKERS:
- at least 20 (more would be better)

FOOD/WATER CARDS:
- one per herbivore
- 1" by 4"

FOOD	FOOD	FOOD	FOOD	FOOD
WATER	WATER	WATER	WATER	WATER

MARKERS OR HATS:
- to define carnivores

TO PLAY:

Each person is assigned an animal which he will be. He may be any one of the below listed carnivores or herbivores. The participants also receive "Life Cards". Each animal receives a varying number of life cards -- herbivores generally get eight or more each, with carnivores receiving three or four. Carnivores receive markers, herbivores a blank (unpunched) FOOD/WATER card.

The herbivores are told that to survive they must find as many food and water sources as they possibly can -- the more the better. The sources are marked FOOD (or WATER) and an orienteering punch is hung at each. Upon discovery, the F/W card is punched. The second thing that they must do to survive is to avoid becoming FOOD for carnivores.

The carnivores are told that to survive they must get as much food (only) as possible, but their food is the herbivores. Upon catching a herbivore (by tagging) the carnivore takes one of the herbivore's life cards, keeps it, and then goes on to get more.

All animals are also susceptible to certain elements such as disease, fire, drought. At least one person should be assigned to be one of these elements. The more animals there are participating, the more elements that can be introduced. Again, disease must tag the animal before receiving a life card.

The final threat to an animal's survival is MAN. When man enters the game (five to ten mins. before the game's conclusion) word is passed among animals, for MAN only has to see the animal to win a life card. He does not have to tag.

ADDITIONAL RULES AND AIDS:

1. A) Foxes may not kill deer.
   B) Foxes may not be killed by wolves.

2. A) Carnivores may not catch the same herbivore twice consecutively. He must catch another one in between.
   B) Carnivores may co-operate on a kill but only one may obtain the life card. Similarly, a carnivore coming upon a recently captured herbivore may not take a life card until he has captured some other herbivore first.

3. All carnivores and disease should be given an extra shower ring to collect life cards on.

4. Carnivores may only survive off their own life cards. They may not use those of their prey.

5. After playing this game a number of times, many innovations may be added. For example, dividing all animals into male and female. The males are given the females' life cards. Before the search for food may begin the pairs must find each other (symbolic mating) and exchange cards.

TO START:

A. Ensure that each person who is an animal has 1) his life cards
   2) a marker of FOOD/WATER card

B. Define the boundaries.

C. Allow herbivores to scatter first. Hold the carnivores, element(s), and MAN.

D. Then in three or four minute intervals let the foxes, then the wolves, then disease, etc, go.

E. The game continues for an indefinite length of time. MAN should never be in before the last ten minutes. (The more life cards each animal has, the longer the game can be played.)

F. Have a follow-up and discussion. How did you feel? What strategies did you use? What happened when man entered? Why does he only have to see to kill? Statistics -- How many were killed by natural predation? By diseases? By man? and so on. (Most important part of game!)

Arts & Crafts

CRAFT IDEAS USING NATURAL MATERIALS

MATERIALS	PROCESS	USE
driftwood	leave in natural state or rub it down with oil or wax	decoration, jewelry, mobiles totem poles
twigs & branches	whittling and carving	furniture, birdhouses, whisk brooms, spoons, forks, name-tags, pins
bark	soak in hot water to make it pliable	bookmarks, hatbands, pocket-books, whistles
nuts	clean with wire brush, sand-paper and wax, oil or shellac	bracelets, brooches, ear-rings, label pixies
pine needles		brooms, pillows
pine cones		animals, mobiles, birdfeeders, dolls, collages
berries		use juice for dyeing or staining
fungi	dry and then shellac to preserve	name plaques, shelves
mosses		pictures
seeds		bean bags, jewellery, rhythm instruments, collages, signs
sand		painting

DYEING

raspberries	dark red	onion skins	red or yellow
strawberries	red	bark	brown
goldenrod	yellow	dandelion roots	magenta
blackberries	blue		

ART ACTIVITIES

Spore Printing

Spore plants, such as mushrooms and toadstools multiply themselves by shedding a fine powder made up of particles called spores. These spores produce the new plant.

Place the head of a toadstool or mushroom, underside down, on a white sheet of paper and keep it in a dry place overnight. In the morning you will find that spores will have fallen on the paper and formed a pattern called a spore print.

Alternative: Apply a thin coat of a half-mucilage-half-water mixture (or a slightly beaten egg white) to a sheet of thin cardboard. Leave the mushroom, underside down, on it overnight.

Leaf Prints

Pin pressed leaves or ferns on drawing paper. Spatter paint on paper by scrapping a toothbrush dipped in paint or ink across a screen. Remove leaves when ink is completely dry.

Alternative: Apply ink to back of dried leaf with a roller. Carefully press a sheet of paper over inked leaf.

Sand Casting

Put sand in a box large enough to hold object which is to be cast plus a border along all sides. Dampen sand so the grains will stick together. Draw or carve design in sand or sink object to be molded. In a separate container, stir equal amounts of water and plaster of paris until mixture thickens. Pour plaster into depression filling deepest areas first. If you are making a plaque, place a twisted wire in the back to make a wall hanger. Remove plaster when hardened (approximately one hour). Some sand will stick to the plaster. It may be left for texture or may be removed with a brush. Design may be painted.

Rubbings

Cover leaf, fern, bark, twig, etc., with a thin piece of paper. Hold the paper with one hand, and with the other, rub a crayon gently over the paper. When you have finished you will have a detailed print of your piece of nature.

Sun Prints

Pin one or more leaves to a piece of colored construction paper, and put the paper in bright sunshine. After an hour or so, remove the leaves and you will have their outlines.

Soil Painting

Collect various types and colors of soil. Now sketch a picture on a piece of cardboard and apply glue where you want one type of soil. Sprinkle on soil. Brush glue on another area of picture, not too close to the already drying area and add new soil. Continue until scene is complete. When soil is completely dried, stand the picture on a side and the loose particles will fall off.

Alternative: Mix soil with plaster of paris and apply immediately. Soil will dry lighter than it goes on.

Tables Mats

Place several leaves and colored threads or small ferns between two sheets of wax paper. Press with a warm iron to seal paper together. Use scissors to scallop edges.

Poetry

THE FOLLOWING THREE POEMS WERE REPRINTED FROM THE BOOK "NOPA, AN ANTHOLOGY OF NORTHERN ONTARIO POETRY, NOPA PUBLISHING", 217 WINDERMERE AVE., THUNDER BAY 'P', ONTARIO.

LOON

A lone, wild figure in the wilderness;
Its eery cries echo and re-echo
from shores of Northern lakes.

The lingering notes
-drifting over the wilds
-reaching the ear
-teasing the soul
-forlorn
-hideous
-cheerful
-laughful
-mysterious
-challenging

The Loon
-shunning companionship
 yet lingering near
Never out of hearing.....
Forever out of sight.....
Forever present.....
                    forever gone.....
.....behind an island
     beyond that point
     across the bay
     on distant waters

The Loon
-haunting solemn bays
 in the deepest wilderness
-rippling waters before
 silent wooded shores
-waltzing over waves beneath
 musical Northern skies.

Waters
-tinkling with the chimes
of the near stars
-pastel with the glow of dawn
-the fire of dusk
-reflecting the crispness of the moon
-the silhouetted shores.

The Loon
-that extra touch of rugged beauty
in the Northern wilds.
.....forever wandering -
waiting -
watching -

.....a mysterious god-send?
So secretly sinister.....
beautiful.....
ominous.....
the last frontier.

by: Dennis Wm. Smyk

DAYBREAK
Silver domes
   Insilent valleys rise
Tiny things rustle
          damp leaves
In stirring.

A doe
Motionless in the meadow,
Grazing,
Head lowered;
.....raised
Trembling nostrils
     Searching easy air
        Ears erect,
     Motionless.

by: James Gilbert

WITHOUT A CARE

Who soars high, gliding like a ship, on an ocean of air?
Who builds castles wherever they please?
Who flittingly flies about, like a breeze, without a care?
The answer simply -- the birds, the ants, and the bees.
The birds adorned in finery
soar the unknown heights, where none can see;
The busy ants stay firmly on the ground,
Toiling co-operatively to build their castle-mound,
While the butterflies and buzzing bees
Each colorful flower unceasingly tease.
Each one has a way of life,
So becoming -- without strife,
So carefree -- without responsibility,
So magnificently fascinating in all eternity.
Mankind, like our native friends, blindly flits and dreams,
Soars in high, though it likely seems
If he only took a hint from the industrious ant,
His time would be better spent
Working co-operatively, for the common good, on the ground
To perpetuate, among fellow men, relations safe and sound.

by: J. Skavinski

Song to Bring Fair Weather:

You, whose day it is, make it beautiful,
Get out your rainbow colours,
So it will be beautiful. Nootka Indians

Rain Song:

Hi-iya, naiho-o! The earth is rumbling,
From the beating of our basket drums.
The earth is rumbling from the beating
of our basket drums, everywhere humming.
Earth is rumbling, everywhere raining.

Hi-iya, naiho-o! Pluck out the feathers,
from the wing of the eagle and turn them
toward the east where lie the large clouds.

Hi-iya, naiho-o! Pluck out the soft down
From the breast of the eagle and turn it
toward the west, where sail the small clouds.

Hi-iya, naiho-o! Beneath the abode
of the rain gods it is thundering;
Large corn is there, Hi-iya, naiho-o!
Beneath the abode of the rain gods
It is raining; small corn is there. Pima Indians

This song was thought to produce rain. The feathers and down of the eagle represent the gathering clouds.

Plaint Against the Fog

Don't you ever,
You up in the sky,
Don't you ever get tired
Of having the clouds between you and us? Nootka Indians

Now try writing your own poetry!

Cinquain

1st line - one word - a noun - what you see

2nd line - 2 descriptive words - what does the object look like?

3rd line - 3 action words about the object

4th line - 4 words - how does the object make you feel?

5th line - 1 word - meaning the same as the first word

Hill
soft, rolling
sitting, watching, protecting
giving me quiet, peace
Nature.

Haiku

The art of Haiku poetry is to capture on paper the feeling one gets when observing something that catches the eye. This form of poetry originated in Japan.

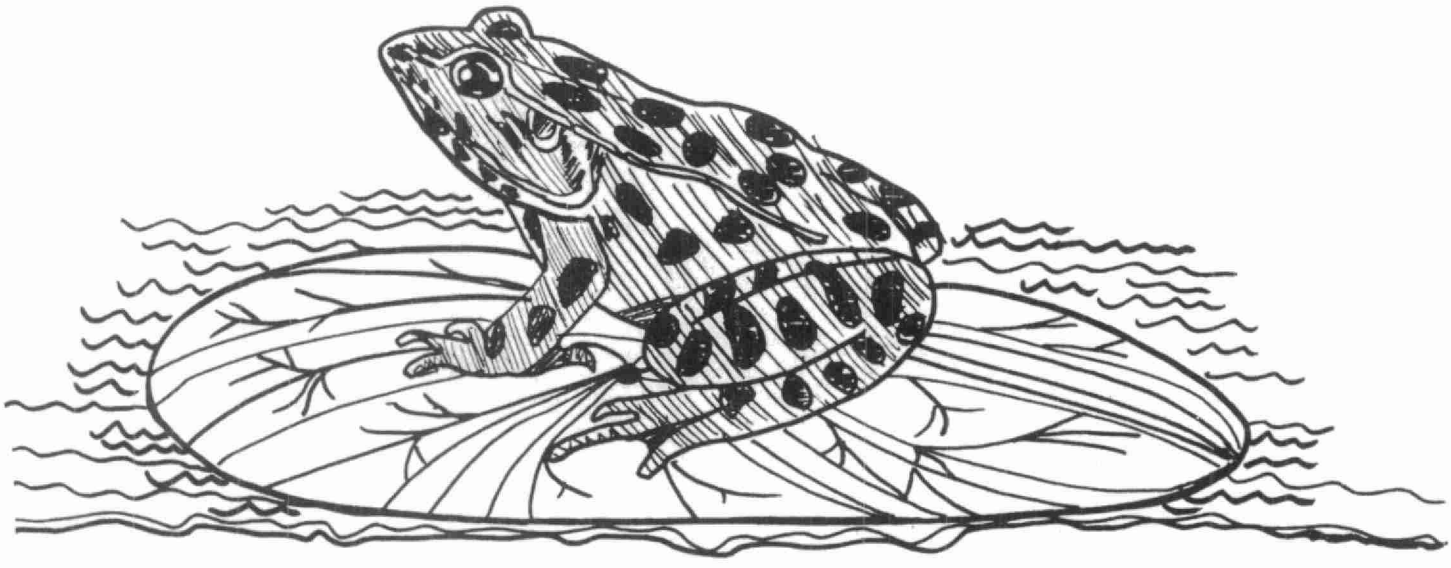
1st line - 5 syllables

2nd line - 7 syllables

3rd line - 5 syllables

Bitter blue berry
As blue as the sky above
Feeds the hungry birds.

Songs



1. HAPPY WANDERER

I love to go a wandering
Along the mountain track
And as I go I love to sing
My knapsack on my back,

CHORUS

Val de re, Val de ra
Val de ha ha ha ha ha, Val de re
Val de ra, My knapsack on my back.

I love to wander by the stream
That dances in the sun
So joyously it calls to me
Come join my happy song

I wave my hat to all I meet
And they wave back to me
And blackbirds call so loud and sweet
From every greenwood tree.

High over head the sky larks wing
They never rest at home
But just like me they love to sing
As o'er the world we roam.

Oh, may I go a wandering
Until the day I die
Oh, may I always laugh and sing
Beneath God's clear blue sky.

2. HOME ON THE RANGE

Oh give me a home where the buffalo roam
Where the deer and the antelope play,
Where seldom is heard
A discouraging word,
And the skys are not cloudy all day.

CHORUS

Home, home on the range,
Where the deer and the antelope play
Where seldom is heard a discouraging word,
And the skys are not cloudy all day.

How often at night when the heavens are bright
And there's light from the glittering stars,
Do I stand there amazed and ask as I gaze
If there glory exceeds that of ours.

3. I'D LIKE TO TEACH THE WORLD TO SING

I'd like to build the world a home
And furnish it with love,
Grow apple trees and honey bees
And snow-white turtle doves,
I'd like to teach the world to sing
In perfect harmony
I'd like to hold it in my arms
And keep it company.

I'd like to see the world for once
All standing hand in hand
And hear them echo through the hills
For peace throughout the land

That's a song I hear
Let the world sing today
A song of peace that echoes on
And never goes away.

I'd like to build the world a home
And furnish it with love,
Grow apple trees and honey bees
and snow white turtle doves.

4. BLOWIN' IN THE WIND

How many roads must a man walk down
Before you call him a man?
Yes'n' how many seas must a white dove sail
Before she sleeps in the sand?
Yes'n' how many times must the cannon balls fly
Before they're forever banned?
The answer, my friend, is blowin' in the wind,
The answer is blowin' in the wind.

How many times must a man look up
Before he can see the sky?
Yes'n' how many ears must one man have
Before he can hear people cry?
Yes'n' how many deaths will it take till he knows
That too many people have died?
The answer my friend, is blowin' in the wind
The answer is blowin' in the wind.

5. COUNTRY SUNSHINE

I was raised on country sunshine
Green grass beneath my feet,
Runnin' through fields of daisies,
Wadin' through the creek,
You love me and it's inviting
To go where life is more excitin'
But I was raised on country sunshine.

I was raised on country sunshine
I'm happy with the simple things,
A Saturday night dance, a picture show
And the joy that the bluebird brings,
I love you please believe me
I wouldn't want you ever to leave me,
But I was raised on country sunshine.

There's just somethin' 'bout the morning
That makes each day a joy to see,
And night time brings a peaceful feeling
Stretched inside of me
Yes you love me and it's invitin'
To go where life is more exciting,
But I was raised on country sunshine.

6. RAINDROPS KEEP FALLIN' ON MY HEAD

Raindrops keep fallin' on my head,
And just like the guy whose feet are too big for his bed,
Nothin' seems to fit,
Those raindrops keep fallin' on my head
They keep fallin' !
So I just did some talkin' to the sun
And I said I didn't like the way he got things done
Sleepin' on the job
Those raindrops are fallin' on my head,
They keep fallin' !
But there's one thing I know,
The blues they send to meet me
Don't defeat me.
It won't be long
Till happiness steps up to greet me
Raindrops keep fallin' on my head
But that doesn't mean my eyes will soon be red,
Cryin's not for me
'Cause I'm never gonna stop the rain by complainin'
Because I'm free,
Nothin's worryin' me.

7. WALKING IN THE SUNSHINE

Walkin' in the sunshine
Sing a little sunshine song
Put a smile upon your face
As if there's nothing wrong.
Think about the good time
Had a long time ago;
Think about forgetting about
Your worries and your woes
Walkin' in the sunshine
Sing a little sunshine song.

La la la la la dee oh
Whether the weather be rain or snow
Pretending can make it real;
A snowy pasture, a green and grassy field.

8. MOON RIVER

Moon river, wider than a mile,
I'm crossing you in style someday.
Old dreamaker, your heartbreaker.
Wherever you're goin', I'm goin' your way,
Two drifters, off to see the world,
There's such a lot of world to see
We're after the same rainbow's end
Waitin' round the bend,
My huckleberry friend,
Moon river, and me.

9. I'M LOOKING OVER A FOUR LEAF CLOVER

I'm looking over a four leaf clover
That I overlooked before,
One leaf is sunshine, the second is rain,
Third is the roses that grow in the lane,
No need explaining the one remaining,
It's someoobody I adore,
I'm looking over a four leaf clover
That I overlooked before.

10. MOCKING BIRD HILL

When the sun in the morning,
Peeps over the hill
And kisses the roses
Around my windowsill
When my heart fills with gladness,
As I hear the thrill
Of the birds in the treetops
On mocking bird hill.

Chorus:
Tra-la-la, tweedle-e-de-de
It gives me a thrill,
To wake up in the morning,
To the mocking bird trill,
Tra-la-la, tweedle-e-de-de
There's peace and good will,
You're welcome as a flower
On the mocking bird hill.

When it's late in the evening,
I climb up the hill,
To survey all my kingdom,
While everything's still
Only me and the sky,
And an old whipperwill
Singing songs in the twilight
On mocking bird hill.

Got a 3 cornered plow and an acre
to till
And a mule that I bought for a ten
dollar bill
And a tumbled down shack and a
rusty old mill
But it's my home sweet home up on
mocking bird hill.

11. FOUR STRONG WINDS

Chorus:
Four strong winds that blow lonely
Seven seas that run high
All these things that won't change
come what may
But our good times are all gone
And I'm bound for moving on
I'll look for you if I'm ever back
this way.

I guess I'll go out to Alberta
The weather's good there in the fall
I've got some friends that I can go
a working for
But I wish you'd change your mind
If I asked you one more time
But we've been through that a
hundred times or more.

If I get there before the snow
flies
And if things are working well
You could meet me if I sent you
down a fare
But by then it would be winter
Nothing much for you to do
And those winds sure can blow
cold way up there.

12. THIS LAND IS YOUR LAND

As I was walking that ribbon of
highway
I saw above me that endless skyway
I saw below me that golden valley
This land was made for you and me.

I've roamed and rambled and I've
followed my footsteps
To the fir clad forests of our mighty
mountain
And all around me a voice was sounding
This land was made for you and me.

CHORUS: This land is your land
This land is my land
From Bona-Vista to Vancouver
Is.
From the Artic Circle
To the Great Lake Waters

13. TODAY

Today while the blossoms
Still cling to the vine
I'll taste you're strawberries
I'll drink you're sweet wine
A million tomorrows shall all
pass away
E're I forget all the joy that
is mine
Today
I'll be a dandy and I'll be a
rover
You'll know who I am by the songs
that I sing
I'll feast at you're table, I'll
sleep in you're clover
Who cares what tomorrow may bring
I can't be contented with
yesterday's glory
I can't live on promises winter
to spring
Today is my moment and now is my
story
I'll laugh and I'll cry and I'll
sing.....

14. TRY TO REMEMBER

Try to remember when life was so
tender
That no one wept except the willow
Try to remember when life was so
tender
That dreams were kept beside your
pillow
Try to remember when life was so
tender
That love was an ember about to
billow
Try to remember and if you remember
Then follow.....

Deep in December it's nice to
remember
Altho' you know the snow will
follow
Deep in December it's nice to
remember
Without a hurt the heart is hollow
Deep in December it's nice to
remember
The fire of September that made us
follow
Deep in December our hearts should
remember
And follow.....

15. PUSSYWILLOWS, CAT-TAILS

Pussywillows, cat-tails, soft winds
and roses,
Rain pools in the woodlands, water
to my knees,
Shivering, quivering, the warm
breath of spirng,
Pussywillows, cat-tails, soft winds
and roses.

Cat-birds and corn-fields, day-dreams
together,
Riding on the roadside, the dust gets
in your eyes,
Reveling, dishelveling, the summer
nights can bring,
Pussywillows, cat-tails, soft winds
and roses.

Slated rays and colored days, starkblue
horizons,
Naked limbs and wheat bins, hazy
afternoons,
Voicing, rejoicing, the wine cups do
bring,
Pussywillows, cat-tails, soft winds
and roses.

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